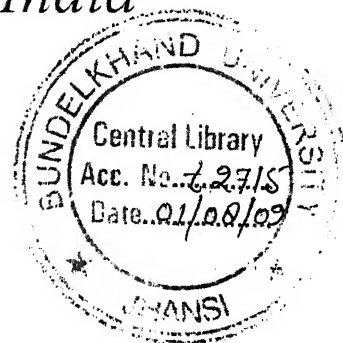


# *Taxonomic Evaluation of Morphology And Distribution of Trichomes in The Taxa of Passiflorales of Central India*



*Thesis*

*Submitted for the degree  
Of  
Doctor of Philosophy  
in  
Botany (faculty of life science)*

*Bundelkhand University, Jhansi*

**2007**

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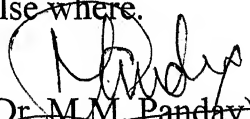
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CERTIFICATE.

It is here with certified that the thesis entitled “ **Studies on Taxonomic Evaluation of Morphology and Distribution of trichomes in the taxa of Passiflorales of Central India**” being submitted for the award of Ph.D. degree in Botany is record of bonafied investigations carried out by Vaibhav Mishra. He has worked for the period required under the University Ordinance No. 7.

It is also certified that the aforesaid subject was approved by the Research Degree committee (Botany) of Bundelkhand University, Jhansi (U.P.) vide letter No. BU/Ad. / Res. / 2004/3386-88 dated 2/10/2004 and that with the exception of supervision and guidance received from the undersigned, this thesis embodies candidates own unaided work and his original contribution which has not previously formed the basis for the award of any degree or diploma etc. else where.

Date : 15.02.2007

  
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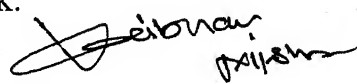
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Place- Jhansi. 284001

Date: 15/2/2007

  
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# CHAPTER- I.

INTRODUCTION

AND

REVIEW

OF

LITERATURE

## CHAPTER -I

### INTRODUCTION & REVIEW OF LITERATURE

The science of taxonomy is now not simply based on vegetative & floral characters, as in the older times. Many new data such as Anatomical, Cytological, Physiological, Biochemical, Palynological, Epidermal appendages are regarded as very important in determining the relationship and affinities of the plants. Taxonomy now is a transcendental disciplines which comprehends and use information from all other disciplines of science.

Angiosperms show diverse epidermal characters often correlated with taxonomic delimitation. Solereder (1908) in his "Systematic Anatomy of dictoyledons" writes "The systematic value of the hair covering is very great....: ?

Prat (1948) recognised such epidermal characters viz. stomata, epidermal cells and hairs. Cowan (1950) adopted the term "TRICHOME" from Greek meaning "a hairy covering". According to Carlquist (1961) Trichomes are useful tools for systematic comparision of angiosperms because of their almost universal occurence, their variety, diversity and their easy preparation for sudy.

Trichomes which are common on almost all the Angiospermic plant parts in a multitude of forms and size, have attracted the attention of Botanists from the early days. But the interest in trichomes taxonomy has long been quite superficial in earliers days. Linnaeus (1735) distinguished the trichome as a subsidiary organs alongwith stipules, bracts, spines thorns and tendrils of the plant. Henstein (1868) gave due consideration to trichome characters for taxonomic delimitations. He figured glandular hairs on the leaf of *Azalea india* L. The first Scientific definition of trichome was given by Jung (Sachs, 1890, P. 61) According to him "Trichomes are the Structure born by the upper parts of plants and are secondary rank as compared to stem, leaf, flower and fruits.

The Botanical literature contains more than 300 description of trichome types in order to characterize their great variation. The trichome appendages arise from a series of anticlinal and periclinal divisions of epidermal cells to form specialized trichomes that function as glandular or non-glandular trichomes. Such integral elements of the plant surface, which are all outer growths of the epidermis are termed Trichomes. They are taxonomically very usefull and functionally, trichomes protect the plant from herbiovers, from heat and Sunlight (Werker, 2000).

The term trichome is used in a very broad sense to designate collectively all diversified unicellular and multicellular appendages that develop from epidermal as well as sub-epidermal cells.

In recent past, Carlquist (1958,59a, 59b) studied the structure and ontogany of glandular trichomes of Madineae, Calydenia and Holocarpa. Cown (1950) has emphasized that trichomes provide excellent criteria for distinguishing Sub-generic and specific levels in Rhododendrons .

Recently Levin (1973) has defined the terms trichome as a hair like appendage extending from the epidermis of an aerial tissue. Similarly, forms and distribution of trichomes was correlated with specific and Sub-generic distinction in *Nicotiana* by Good Speed (1954).

In recent years, the taxonomic significance of morphology and distribution of trichomes for taxonomic delimitation has also been successfully stressed in various plant groups by many researchers viz. Mathur 1961, Inamdar 1967, Ramayya & Rajgopal 1971, Patel & Inamdar 1972, Jain & Singh 1973, Rammayya & Prabhaker 1973, Martinus 1974, Singh et.al. 1974, Guedes 1975, Knoboch et. <sup>al.</sup> 1975, Oleson 1975, Rollins & Banerjee 1975, Singh & Jain 1975, Rao & Ramayya 1977, Fahn & Shimony 1977, Lersten 1977, Ahmad 1978, Akers et. al. 1978, Tiwari 1978, Turner et.al. 1978, Ghosh 1979, Franklin 1979, Rajagopal 1979.

Dehagan 1980, Sahu 1982, Mishra 1984, Werker. et. al 1985, Fahn 1986. Gornall 1986, Ahmad 1988). Pandey 1989, Rao 1991, Dwevedi & Ahmad 1994, Parihar 1998, Spring 2000 & Yashodhara et.al. 2002. Besides the vegetative parts, floral parts have also been studied for their trichomes type in *Cleome viscosa* (Ramayya & Gopal Charulu, 1968), *Ipomoea* (Inamdar , 1968), *Capsicum* (Raghuvanshi & Singh, 1972) , Scrophulariaceae (Datta & Deb, 1975), *Solanum* (Siddique et.al., 1978) *Crotolaria* (Gupta 1980), *Canavalia gladiota* (Shah & Mohandas, 1982), *Salvia* (Rabid, 1985), *Artemisia* (Pais, 1987), *Mentha* (Majjes et. Al. 1989), *Corchorus* (Singh & Dubey, 1993), *Muntingia* (Singh & Bhatt, 1993), *Hibiscus* (Hussain et. al. 1995), *Croton* (Webster.et.al. 1996), *Durio* (Salma 1999), *Zingiber* (Gogoi et. al. 2002) and *Betula sps.* (Valkama et.al. 2003).

The surface of leaves and of other plant organs are commonly covered by various non glandular and glandular trichomes. Recently an extensive work has been done on different aspects of trichomes. Scientific interest in plant trichomes is based on their functional and taxonomic importance and on the economic usefulness of some trichome generated products. Trichome play an important role in plant defence, especially in relation to phytophagus insects. When non glandular trichomes form a dense indumentum , they may serve as mechanical barrier against various external factors, such as herbivores and pathogens, uv-B radiations, extreme temperatures and excessive water loss. In a number of taxa there is a negative correlation between trichome density and insect feeding, oviposition response and nutrition of larvae (Levine, 1973). A relationship between pubescence and pest resistance has already been established by Poose (1929), Poose & Smith (1931) Further, the glabrous varieties are the sufferers of high infestation and oviposition than the pubescent varieties. Johnson (1953) reported that larva or adult of *Aphis craccivora* may be permanently impaled or die by the presence of hooked trichomes on French bean

(*Phaseolus vulgaris*). In some plant groups protection against large mammals is achieved by the presence of stinging trichomes (Levine, 1973). In this regard, detailed study of morphology and toxicology of stinging hairs has been carried out by many workers on various plants viz . *Jatropha* (Haberlandt , 1914), *Tragia voluvillis* (Knoll, 1905), *Urtica dioica* and *u. arens* (Wicke, 1861; Rauter, 1872), *Tragia cannabina* (Rao & Sundra Raj , 1951) and *Tragia saxicola* and *Urtica dioica* (Thurston, 1969, 1974). Recently impact of trichome density on the infestation of virus disease in *Benincasa hispida* was studied by Khan et. al. (2000). According to him trichome density was found to have a significant negative influence on the number of aphids.

Similarly, Sharma & Tyre ( 1973) have studied the role of trichomes in relation with environmental pollution. They have suggested that trichomes can be used as indicator of environmental pollution. Wegoner (1975) found that the trichome density and length is changed in highly polluted area.

Classification of trichomes based on their structure has been attempted by many workers. Among them Weiss (1867) was the first who divided plant hairs into three major groups viz. (I) all the constituent cells of hair are of same kind, (II) all the constituent cells are not of the same kind (III) cells provided with a secretion. Router in 1872 (cf.upof , 1962 P.11) proposed possibly the first ever classification of trichomes based on ontogeny . He divided them into two groups:

- (a) those derived from epidermal cells and (b) other which have their origin in epidermal as well as sub epidermal cells. (emergence). De Bary (1884) classified trichomes in to the following six types:
- (a) papillose (b)hairs (c) scales (d) shaggy hairs
- (e) worts (f) prickles.

In recent years a good number of papers have been published which deal with trichomes and their systematic classification .

Some note worthy ones are those of Metcalf & Chalk 1950, Hummel & Staesche (1962), Ramayya (1962), Inamdar & Patel (1973), Singh & Jain (1975), Alleykutty & Inamdar (1978) and Leela Vathi & Ramayya (1983).

Among the several classifications of trichomes available in the literature, the one presented by Ramayya (1962 a, 1962b ) is the most natural. It stresses the basic structural patterns of trichomes and it is also very close to the ontogenetic classification presented by the same author in 1972. He divided trichomes into five phyletic systems (a) unicellular (b) Uniseriate filiform, (c) Uniseriate macrofomm (d) M-multiseriate , and (e) P- multi seriate. Hence, in order to consider the value of trichome in classification and phylogeny, it is necessary that trichome types and trichome systems should be thoroughly studied . In this regards, Pyne (1978) was the first to publish. "A Glossary of plant hair terminology" having most concised terminology. The glossary is divided into two sections. Part I includes terms for types and attributes of individual hair kinds and hair clusters. Part II deals with kinds and characteristics of induments. Thus a considerable interest seems to have been created in studying the plant trichomes leading to accumulation of sufficient data in many orders and families of angiosperms. For example, Compositae (Ramayya, 1962) Oleaceae (Inamdar 1967), Gentianales (Patel & Inamdar, 1972); Polymoniales (Inamdar & Patel, 1973), Loganiaceae (Bendre, 1973), Cucurbitaceae (Inamdar & Gangadhara, 1975), Malvaceae (Ramayya & Rao, 1976), Capparidaceae (Gupta & Murthy , 1977), Euphorbiaceae (Inamdar & Gangadhara, 1977), Acanthaceae (Ahmad, 1978), Combritaceae (Stace 1980), Ranales (Alley kutty, 1980), Helianthoideae (Sahu, 1982), Euphorbiaceae (Mishra, 1984), Asteroideae (Sahu, 1985),



Scrophulariaceae (Ahmad-B, 1988) Verbenaceae & Lamiaceae (Pandey, 1989), Tiliaceae (Sharma, 1990), Malvales (Parihar, 1998).

Order Passiflorales is a group of seven families (Bentham & Hooker 1862-1883). Among these, taxa of three families are recorded from Central India. These are Passifloraceae, Cucurbitaceae and Begoniaceae. Mishra (1982) in his extensive survey for floristic study, reported only 30 taxa of Cucurbitaceae, three taxa of Passifloraceae and only one taxa of Begoniaceae from Central India. Thus family Cucurbitaceae stand at high position in the order Passiflorales.

Further the phylogenetic position of the Cucurbitaceae has been much debated. According to Robert Brown, Bentham & Hooker, de Candolle and Naudin, the Cucurbitaceae in having (i) Parietal Placentation (ii) Bitegmic, Crassinucellate ovule, are related to Passifloraceae. According to Hallier, Rendle and Hutchison also, the Cucurbitaceae is related to Begoniaceae and the Datisceae, the three families comprising an order, the Cucurbitales which is thought to have arisen from the Passifloraceae. Bassey included the Cucurbits together with the Begoniaceae in the order Loasales. Thus according to all these authors, the Cucurbitaceae is considered to be a family of the polypetalae and related to such families like the Passifloraceae, Begoniaceae, Loasaceae, Datisceae and others in the order Passiflorales.

Much has been written about Cucurbitaceae and its affinities with Begoniaceae and Passifloraceae (Lindley 1830, Endlicher 1836-1850, Jussieu 1789, Brown 1866, Naudin 1855, Haillier 1905, Hutchinson 1926, 1967; Bessey 1915, Rendle 1925, Ghosh 1932, Puri 1945, Chakravarty 1959, Datta 1965, Takhtajan 1980, Dahlgren 1981). Further other aspects like peculiar placentation, bicollateral vascular bundle, morphological nature of tendrils, fruit, seed anatomy, leaf trace bundles, phylogenetic sequence of genera within the family, course of vascular bundle, development of entocyclic phloem (internal phloem). Cytomorphological, Biochemical and Palynological aspects has also been studied

throughly by many workers, viz. Worsdell 1915; Zimmerman 1922. Holroyd 1924, Chakravarty 1947, Whiting 1938, Metcalf & Chalk 1950, Singh 1942, Sofier 1962. Singh & Dathan 1973, Pellisier 1940, Datta & Basu 1978, Olson 2003.

Metcalf and chalk (1950) not only studied leaf petiole anatomy of various Cucurbitis but also observed the epidermal structures. They recorded Ranunculous type Stomata which are frequently raised above the general level of the epidermaal cells, specially in stems. Stometal development was also studied by Ramayya & Rao 1968. They reported mesoperigenous type of stomata in *Cucumis pubescens*.

Thus workdone so far on the trichome structure and their organographic distribution in the taxa of family Cucurbtaceae, Begoniaceae, and Passifloraceae is not extensive. Zimmerman (1922), is credited for his contribution in the investigation of many types of hairs in Cucurbitaceae. He reported uniseriate, multiseriate, explosive hairs etc. in many genera of the family. Metcalf and Chalk (1950), reported seven type of hairs distributed in various members of the family. Later, Inamdar & Gangadhara (1975) investigated the structure, ontogeny and organographic distribution of trichome only in some taxa of Cucurbitaceae.

The perusal of the literature cited above, thus reveals that no exhaustive work has been done on the trichome aspects of the order Passiflorales with special reference to the taxa of family Cucurbitaceae of Central India.

In view of the above facts, the present investigation were under taken which deal with study of taxonomic evaluation of morphology and organographic distribution of vegetative as well as floral trichomes of 29 taxa belonging to three families of order Passiflorales.

## CHAPTER-II.

MATERIALS  
AND  
METHODS.

## CHAPTER -II MATERIAL & METHOD

Present study is based on 29 taxa belonging to 14 genera of three families of order Passiflorales. The taxa were collected from different parts of the central India.

The taxa collected were compared with specimens kept in the herbaria of R.R. I. Ay. Jhansi and Gwalior.

Trichomes were studied in the epidermal peels for their structure , type and distribution on different parts. Of taxa considered in present study (viz. Stem, Tendril, Petiole, Leaves lamina, Pedicel, Inf. Axis, calyx, corolla, stamens and Carpel ). Epidermal peels of fresh as well as preserved materials were taken out for trichome study following the methods of Leela vathi & Ramayya<sup>1983</sup> (1975). Both vegetative and floral parts of each taxa were initially boiled in 5-10% of HCl. After cooling and washing with water, the material were them boiled in 5% NaOH. The materials after cooling were again washed thoroughly in water to get them free from Alkali. The peelings were then stained with aqueous Safranin and mounted in Glycerine. For storing , slides were made semi permanent by ringing the edge of cover slips with the mountent (D. P.X ) .

The slides were studied for trichome structure under the microscope and Camera Lucida diagrams of the trichomes were drawn for their taxonomic evaluation.

The terminology used in the present study is based on that of Ramayya (1962) and Payne (1978) .Various terms used for the description of trichome parts are briefly explained here under:

- I. Foot : It is proximal part of the trichome lying within the epidermal surface. It is recognised into two kinds, viz.
  - A. Simple: consisting of as many cells as the number of cell rows in the immediate overlying part.

- B. Compound : consisting of cells which are more in number than the cells rows in the immediate overlying part.
- II. Body: It is a part of trichome lying above the foot i.e. away from the epidermal surface . it is of two categories, viz.
  - A. Differentiated : consisting of two different parts :
    - 1. Stalk – representing proximal region
    - 2. Nead- representing distal region
  - B. Undifferentiated : the body of the trichome is entire, not differentiated into stalk and head.

Total taxa considered in present study are given in Table 1. Total trichome types recorded during present investigation on 29 taxa are given in Table– 2. Organographic distribution of trichomes is given in table 3A & 3B. Occurrence of trichome types in each taxa is given in Table 4A & 4B. Distribution pattern of trichome types on different plant part is shown in Table – 5. Classification of trichomes observed in present study is shows in Table – 6 .

TABLE - 1 NAME OF TAXA OF PASSIFLORALES STUDIED FOR THEIR TRICHOMES

OTU'S	NAME OF TAXA ↓	FAMILY
1	<i>Citrullus vulgaris</i> , Schrad	Cucurbitaceae
2	<i>C. fistulosu</i> , Stocks in Hook	Cucurbitaceae
3	<i>Coccinia cordifolia</i> , L.	Cucurbitaceae
4	<i>Ctenolepis garcinii</i> , (L). Cl. In Hooker	Cucurbitaceae
5	<i>Cucumis melo</i> , L.	Cucurbitaceae
6	<i>C. var. momordica</i> , Duthie	Cucurbitaceae
7	<i>C. var. utilissimus</i> , Duthie & Fuller	Cucurbitaceae
8	<i>C. sativus</i> , L.	Cucurbitaceae
9	<i>C. trigonus</i> , Roxb.	Cucurbitaceae
10	<i>Cucurbita maxima</i> , Duch.	Cucurbitaceae
11	<i>C. pepo</i> , (L)Roxb.	Cucurbitaceae
12	<i>C. moschata</i> , Duche	Cucurbitaceae
13	<i>Diplocyclos palmatus</i> , (L)Jaffery	Cucurbitaceae
14	<i>Lagenaria vulgaris</i> , Ser. In Mem.	Cucurbitaceae
15	<i>Luffa acutangula</i> , (L)Roxb.	Cucurbitaceae
16	<i>L. echinata</i> , Roxb.	Cucurbitaceae
17	<i>L. cylindrica</i> , (L)M.Roem.	Cucurbitaceae
18	<i>Melothria maderaspatana</i> , Cogn. In DC	Cucurbitaceae
19	<i>Momordica charantia</i> , L.	Cucurbitaceae
20	<i>M. dioica</i> , Roxb. Ex. Willd.	Cucurbitaceae
21	<i>M. balsamina</i> , Wall (Non L.)	Cucurbitaceae
22	<i>Trichosanthes dioica</i> , Roxb.	Cucurbitaceae
23	<i>T. anguina</i> , L.	Cucurbitaceae
24	<i>T. cordata</i> , Roxb.	Cucurbitaceae
25	<i>T. cucumerina</i> , L.	Cucurbitaceae
26	<i>T. bracteata</i> (Lamk.) Voigt.	Cucurbitaceae
27	<i>Benincasa hispida</i> (Thunb.)cogn.	Cucurbitaceae
28	<i>Passiflora foetida</i> , L.	Passifloraceae
29	<i>Begonia picta</i> , Sm. Exot.	Begoniaceae

## CHAPTER-III.

# STUDY OF MORPHOLOGY AND DISTRIBUTION OF TRICHOMES.

## CHAPTER- III

### MORPHOLOGY AND DISTRIBUTION OF TRICHOMES

#### OTU-1. *Citrullus vulgaris*, Schrad.

This taxa shows thirteen types of trichome (Plate 1. Fig. 1-13)

**1. Unic. Papillose:** (Code A I)

**Foot :** Not visible. Body 1 celled, inflated , irregular variously shaped, hyaline; wall thin, vesiculated; content granulated, translucent. (Fig. 1)

**Distb. :** Petals, Stamen and Stigma.

**2. Unic. Conical :** (Code A II)

**Foot:** Simple. Body 1-celled, very short, conical; wall thick; lumen narrow, content dense yellow. (Fig. 2)

**Distb. :** Leaves, Sepals, Petals and Stigma.

**3. Bic. Filiform:** (Code B)

**Foot:** Simple. Body: 2- celled , entire; cells of equal size; lateral and cross walls thin, lumen narrow, content translucent. (Fig. 3)

**Distb. :** Tendril and Petals.

**4. Bic. Conical :** (Code . D)

**Foot:** Various. Body: Various, 2- celled- A. stout (Fig. 4A), B. long, erect; basal cell barrel shaped (Fig. 4B), C. body very short, seated over complicated and elevated foot; content dense golden yellow.

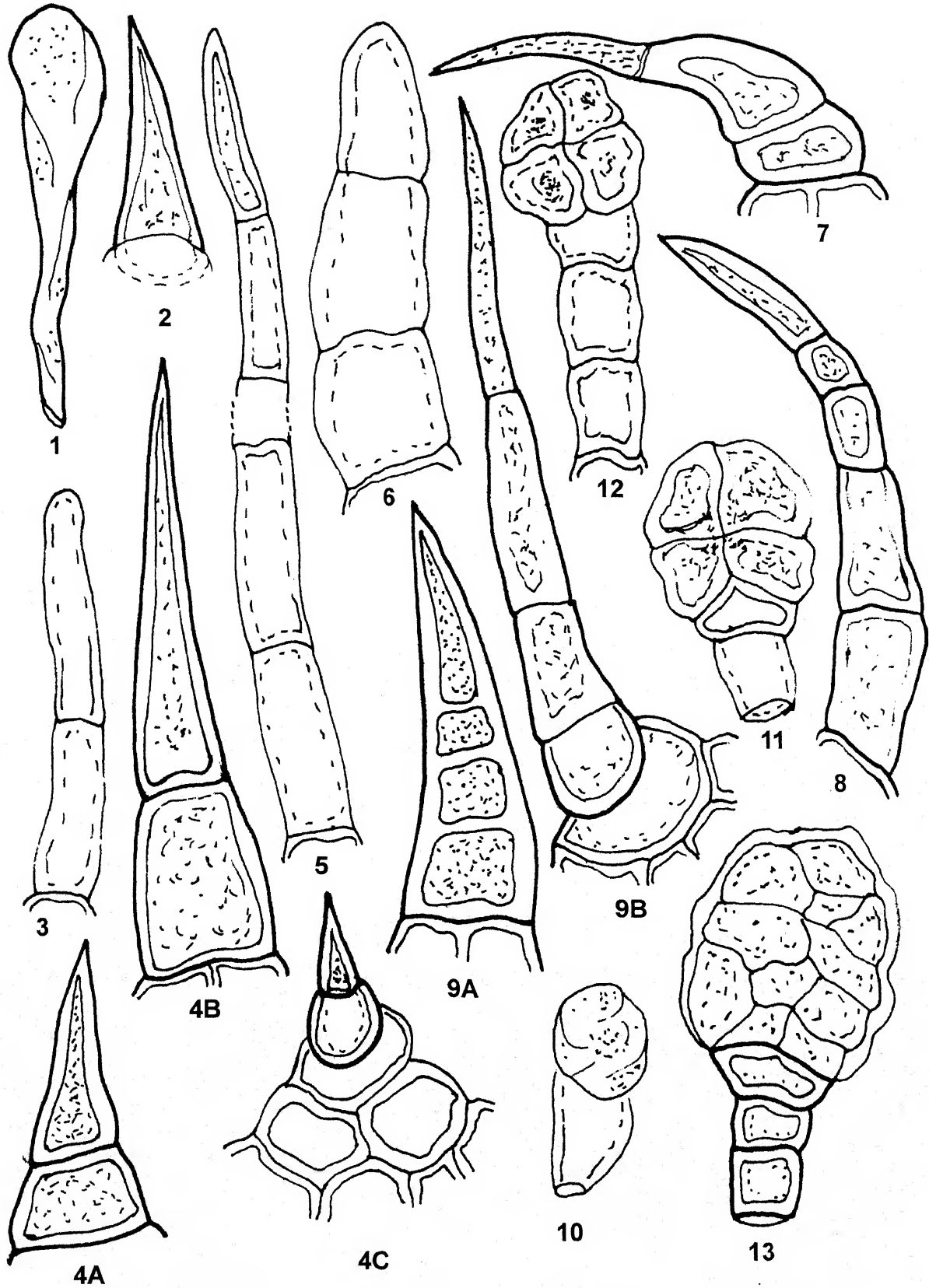
**Distb. :** Stem, Tendril, Petole, Pedicel, Sepal (Fig. 4A & 4B) Leaves, sepals and Petals (Fig. 4C)



## EXPLANATION OF PLATE- 1

Fig. No.	Trichome Type	Mgn.
1.	Unic. Papillose	H x 10
2.	Unic. Conical	M x 10
3.	Bic. Filiform	H x 10
4. A,B,C	Bic. Conical	H x 10
5.	Unis. Filiform	L x 5
6.	Unis. Cylindrical	H x 5
7.	Unis. Hooked	H x 10
8.	Unis. Curved	H x 5
9. A, B	Unis. Conical	H x 10
10.	Unis. Gld.	H x 10
11.	Bic. Gld.	H x 10
12.	Unis. Gld. 4-celled cap.	H x 10
13.	Unis. Gld. M- celled cap.	H x 10

# PLATE-1



**5. Unis. Filiform: (Code G)**

**Foot:** Simple. Body: 5-7 celled, very long, uniseriate, filiform; cells longer than broad; tip rounded; lumen normal; content granulated translucent. (Fig. 5)

**Distb. :** Stem, Petiole, Pedicel and Sepals.

**6. Unis. Cylindrical: (Code H)**

**Foot:** Simple. Body: 3- celled long, cylindrical; cells barrel shaped, hyaline ; tip rounded ; content translucent. (Fig. 6 )

**Distb. :** Tendril, Petals and Ovary.

**7. Unis. Curved : (Code I)**

**Foot:** Compound. Body: Differentiated , 3- celled, lower two cells large, bulbous; terminal cell narrow, long, tapering to a curved, pointed end; content dense yellow. (Fig. 7)

**Distb. :** Stem, Leaves, Pedicel and Sepals.

**8. Unis. Curved: (Code I)**

**Foot:** Simple. Body: 4-6 celled, uniseriate curved; lateral and cross walls thick ; terminal cell long, lanceolate, tip pointed; content granulated. (Fig. 8)

**Distb. :** Stem, Leaves and Sepals.

**9. Unis. Conical : (Code K)**

**Foot:** Compound. Body : 3-5 celled, conical; lateral and cross walls thick Joints distinct; tip rigid and pointed; content yellow. (Fig. 9A) or cells long, terminal cell acerate, basal cell bulbous; content granulated . (Fig. 9B)

**Distb. :** Stem , Petiole, and Pedicel. (Fig. 9A), Leaves Surface (Fig. 9B).

**10. Unic. Gld. Capitate: (Code P)**

**Foot:** Not visible. Body: very small, differentiated; stalk 1-celled, obovate, hyaline; head 1- celled , rounded, wall thin, infolded; content granular, translucent (Fig. 10)

**Distb. :** Tendril, Sepals, Petals, Stamen and Ovary.

**11. Bic. Gld. 4-Celled Capitate : (Code T)**

**Foot:** Simple Body: Differentiated; stalk 2-celled, small, upper cell collared; head 4- celled, dolliform; cells distinct filled with granular dense content. (Fig. 11)

**Distb. :** Stem, Leaves, Sepals and Petals.

**12. Unis. Gld. 4- Celled Capitate : (Code W)**

**Foot:** Simple. Body: Differentiated, stalk 3- celled, uniseriate, thin, cell of equal size, walls thin; head 4- celled, globose, irregular; outer walls thin; content granulated yellow. (Fig. 12)

**Distb. :** Stem, Petiole, Pedicel and sepals.

**13. Unis. Gld. M- celled Capitate : (Code X)**

**Foot:** Simple. Body : Differentiated, stalk 3- celled, very short , cells rectangular; head very large, multi-cellular, oblong; cells irregularly arranged; outer wall vesiculated; content dense, granulated. (Fig. 13)

**Distb. :** Stem, Petiole, Leaves and Pedicel .

**OUT – 2 . *Citrullus fistulosus*, Stocks in Hook**

**This taxa shows thirteen types of trichome (Plate-2, Figs. 1-13)**

**1. Unic. Conical : (Code A II )**

Foot: Simple. Body : 1-celled, acuminate, erect; tip pointed; wall smooth; content granulated. (Fig. 1)

**Distb. :** Tendril, Pedicel, Sepals, Petals and ovary.

**2. Unic. Arrect : (Code A III )**

Foot: Simple . Body: Entire, 1-celled, arrect; wall very thick; lumen narrow, content dense, granulated golden yellow. (Fig. 2)

**Distb. :** Stem, Leaves, Sepals and ovary.

**3. Unic. Flagellate : (Code A VI )**

Foot: Not visible. Body: 1-celled , hyaline, elongated, flexible; content translucent. (Fig. 3)

**Distb. :** Tendril , Petals, Stamen and Stigma.

**4. Bic. Conical : (Code D)**

Foot: Simple . Body: 2-celled , rigid, conical; lateral and cross wall thick, smooth ; tip pointed; content dense. (Fig. 4)

**Distb. :** Stem , Pedicel and ovary.

**5. Bic. Belemnoid : (Code F)**

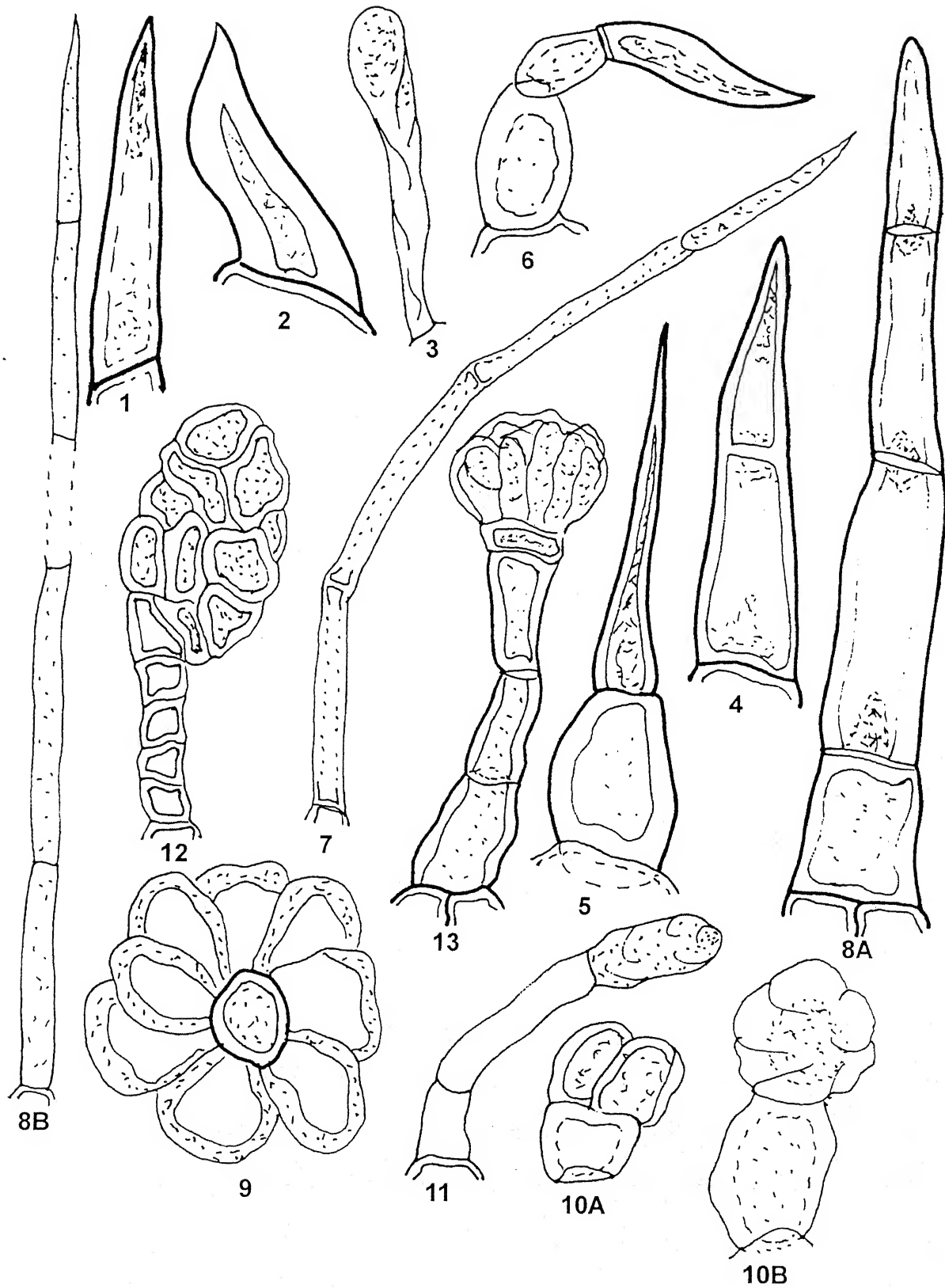
Foot : Elevated, simple. Body: 2-celled , differentiated; basal cell barrel shaped; upper celled acerate, distal end stiff and pointed; content dense. (Fig. 5)

**Distb. :** Stem, Leaves, Sepals and Ovary.

## EXPLANATION OF PLATE- 2

Fig. No.	Trichome Type	Mgn.
1.	Unic. Conical	H x 5
2.	Unic. Arrect	H x 10
3.	Unic. Flagellate	H x 10
4.	Bic. Conical	H x 10
5.	Bic. Belemnoid	H x 5
6.	Unis. Hooked	H x 5
7.	Unis. Curved	L x 5
8. A & B	Unis. Conical	H x 10
9.	Peltate	H x 10
10. A & B	Unic. Gld. Cap.	H x 10
11.	Bic. Gld. Cap.	H x 10
12.	Unis. Gld. M-celled cap.	H x 10
13.	Unis. Neck- celled Gld.cap.	H x 10

## PLATE-2



**6. Unis. Hooked : (Code I )**

Foot : Simple. Body : 3- celled , basal cell largest, oblong; middle cell ovate, bented; terminal cell lanceolate with acute curved end; lumen narrow; content dense, yellow. (Fig. 6)

**Distb. :** Stem, Petiole, Leaves and ovary.

**7. Unis. Curved : (Code J )**

Foot: Simple. Body : 4-8 celled, very long : cells long, narrow, equal size ; terminal cell acuminate ; joint swollen ; content granulated. (Fig. 7)

**Distb. :** Leaves and Sepals.

**8. Unis. Conical : (Code K )**

Foot : Simple or compound. Body: 4-6 celled very long; cells broad and large (Fig. 8A) or columnar, acerate (Fig. 8B); content granulated.

**Distb.:** Stem, Petiole, Leaves and ovary (Fig. 8B) Stem, Pedicel and Sepals (Fig. 8A)

**9. Peltate. : (Code O )**

Foot: Not visible. Body : many – celled, 1-celled thick, rossetted, parallel to epidermal surface; cell rounded, arranged around the central sphere; outer wall vesiculate; content dense , golden yellow. (Fig. 9)

**Distb. :** Pedicel and ovary.

**10. Uni cellular Gld. Capitata : (Code P )**

Foot : Simple. Body: very small, differentiated; stalk 1-celled, hyaline; head 2-celled, isobilateral (Fig. 10 A ) or vesiculated globose; content granulated yellow.

**Distb. :** Tendril, Leaves, Sepals, Petals, Stamen, ovary and Stigma.



**11. Bic. Gld. Capitate: (Code Q )**

Foot: Simple. Body: Flagellated, differentiated; stalk 2-celled , filiform; head 1-celled, oblong; walls hyaline, thin, vesiculate; content granular yellow (Fig. 11)

**Distb. :** Petals and ovary.

**12. Unis. Gld. M- celled Capitate : (Code X )**

Foot: Simple. Body : Differentiated; stalk 4-5 celled, uniseriate, filiform , short; cells small, rectangular ; head multi cellular, oblong; cells irregular; content granulated dense. (Fig. 12)

**Distb. :** Petals and ovary.

**13. Unis. Neck – celled Gld. Capitate : (Code Y)**

Foot: Compound. Body: Differentiated ; Stalk 4-celled, cylindrical, terminal cell disceid and appear as neck; head multicellular, vesiculated; cells columnar arranged in parallel manner; content granulated, dense. (Fig. 13)

**Distb. :** Stem, Leaves, Pedicel and Sepals.

OUT- 3 *Coccinia cordifolia* , Linn.

This taxa shows eleven types of trichomes (Plate – 3, Figs 1-11)

1. **Unic. Curved** : (Code A IV )

Foot: Simple, emarginate. Body: 1-celled, Stiff, curved; tip acute; wall thick; lumen narrow; content dense. (Fig. 1)

**Distb.** : Stem, Tendril, Petiole, Leaves and Sepals.

2. **Unic. Flagellate** : (Code A VI )

Foot: Simple. Body : 1-celled, much elongated, irregular, hyaline, flagellate, unequal; wall thin, content translucent. (Fig. 2)

**Distb.** : Leaves, Sepals, Petals and ovary.

3. **Unic. Cylindrical** : (Code A VII )

Foot: Simple. Body: 1-celled, oblong, hyaline, cylindrical; tip rounded; wall thin; lumen wide, content translucent. (Fig. 3)

**Distb.** : Petal , ovary and Stamens.

4. **Bic. Filiform** : (Code B)

Foot: Simple. Body : 2-celled, narrow, filiform; cells of equal size, columnar; tip rounded; lumen normal; content translucent, opaque. (Fig. 4)

**Distb.** : Stem, Tendril, Petiole, Leaves, Pedicel and Sepals.

5. **Bic. Asept. Flagellate** : (Code E )

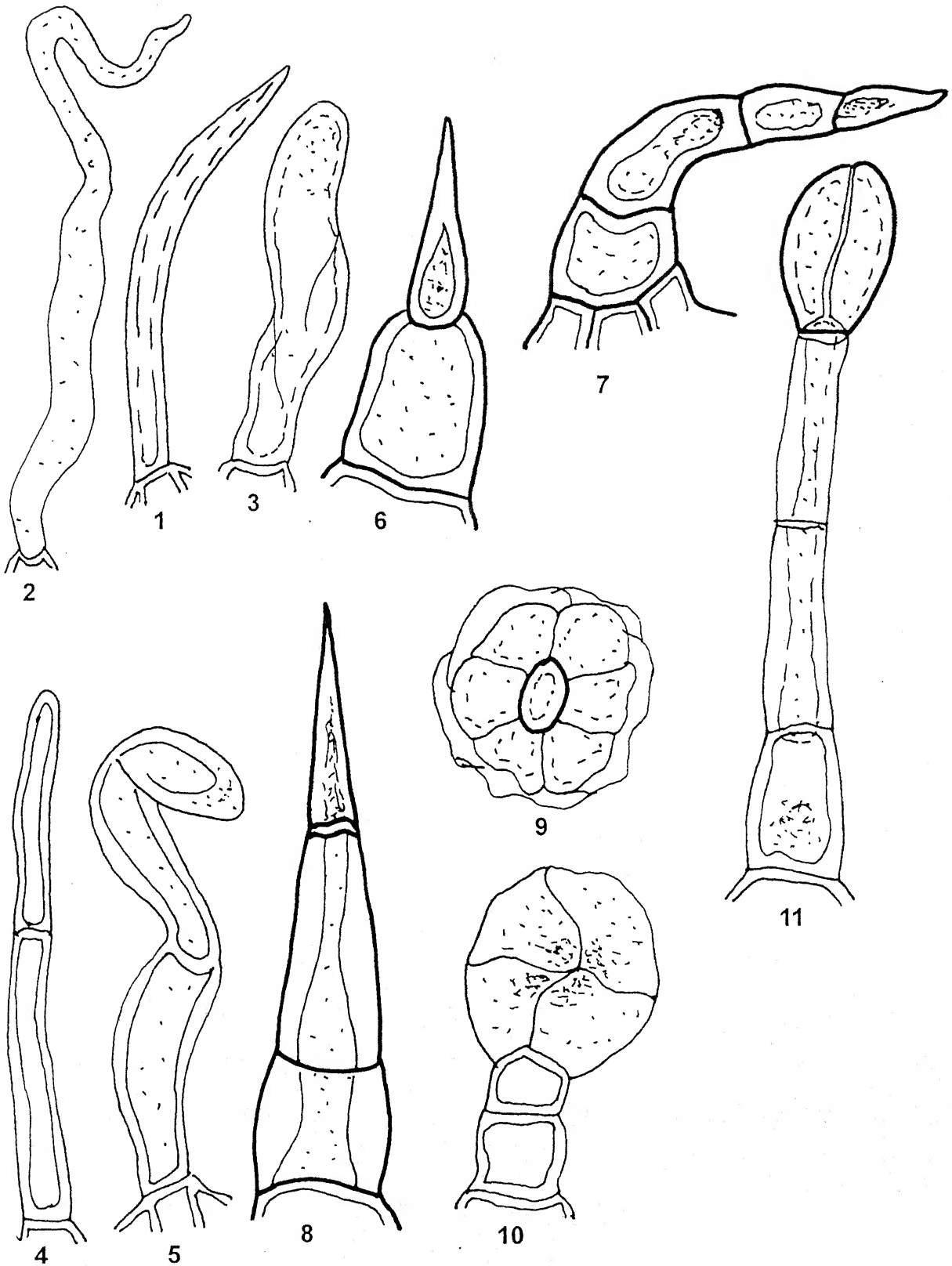
Foot: Simple, elevated. Body: 2-celled , basal cell clavate; upper cell very long, irregular, flagellate; wall thin, lumen wide; content translucent. (Fig. 5)

**Distb.** : Stem , Tendril, Pedicel and Petals.

### EXPLANATION OF PLATE- 3

Fig. No.	Trichome Type	Mgn.
1.	Unic. Curved	H x 10
2.	Unic. Flagellate	H x 5
3.	Unic. Cylindrical	H x 10
4.	Bic. Filiform	H x 10
5.	Bic. Asept. Flagellate	H x 10
6.	Bic. Belemnoid	H x 10
7.	Unis. Hooked	H x 5
8.	Unis. Conical	H x 5
9.	Peltate	H x 10
10.	Bic. Gld. 4-celled Cap.	H x 10
11.	Unis. Gld. 2-celled Cap.	H x 5

# PLATE-3



**6. Bic. Belemnoid : (Code F )**

Foot: Simple, broad. Body: 2-celled , differentiated; basal cell broad, barrel shaped, retuse; upper cell narrow with globose base; tip acute; content dense, granulated , yellow. (Fig. 6)

**Distb. :** Leaves, Pedicel and Sepals.

**7. Unis. Curved : (Code J )**

Foot: Compound, emarginate. Body: 4-5 celled, uniseriate curved; basal cell bulbous, terminal cell short , conical; cross walls distinct granulated thick.(Fig. 7)

**Distb. :** Stem, Petiole and Pedicel .

**8. Unis. Conical : (Code K )**

Foot: Simple. Body: 3-celled, conical; proximal part broad, gradually narrowing to a pointed tip ; terminal cell rigid; lumen narrow; content dense, granulated, golden yellow. (Fig. 8 )

**Distb. :** Stem , Petiole and Pedicel.

**9. Peltate : (Code O )**

Foot: Not visible. Body: multi cellular, 1-celled thick, irregularly spherical, parallel to epidermal surface; outer wall thin and vesiculated; conten granular, yellow. (Fig.9)

**Distb. :** Stem, and Ovary.

**10. Bic. Gld. 4-celled Capitate. : (Code T )**

Foot: Simple. Body: Differentiated , stalk 2-celled errect, small; cells of equal size, hyaline; head 4-celled, globose, hyaline, content granulated opaque.(Fig. 10)

**Distb. :** Stem, Tendril, Leaves, Sepals and Petals.

**11. Unis. Gld. 2-celled Capitate : (Code V )**

Foot : Simple. Body: long, differentiated; stalk 3-celled, filiform, basal cell smallest, oblong; head 2-celled , oval; cells long , hemi spherical; content granulated, golden yellow. (Fig. 11)

**Distb.** : Stem, Leaves, Petiole and Sepals.

**OUT-4 *Ctenolepis garcinii* (L) cl. In Hooker.**

**This taxa shows twelve types of trichomes (Plate No. 4, Fig. 1-12)**

**1. Unicellular papillose : (Code A 1)**

Foot: Simple . Body : Bottle shaped, hyaline; proximal vegin oblong, distal end triangular, necked ; wall thin , infolded; content transluscent. (Fig. 1 )

**Distb. :** Sepals, Petals and Stigma.

**2. Unicellular conical : (Code A II )**

Foot: Simple. Body : 1-celled , long, curved; tip acute; lateral wall thick, rugose; lumen narrow; content dense, granulated, opaque. (Fig. 2 )

**Distb. :** Stem, Petiole, Pedicel, Ovary.

**3. Bicellular conical : (Code D )**

Foot : Compound. Body: 2-celled, erect, conical; basal cell bulbous, upper cell acuminate, tip acute; lateral wall thick; content granulated. (Fig. 3 )

**Distb. :** Stem, Tendril, Leaf, Sepals, Ovary.

**4. Uniseriate filiform : (Code G)**

Foot: Compound. Bulbous. Body ; 3-5 celled, long, filiform; cells of varying length; lateral wall thin , cross walls thick; content granulated, opaque (Fig.4 )

**Distb. :** Stem , Petiole, Leaf, Pedicel,

**5. Uniseriate cylindrical : (Code H )**

Foot: Compound. Body : many celled, cylindrical, hyaline; cells broader than long, irregular; tip cell dome – slaped; wall thin, undulating; content transluscent. (Fig. 5 )

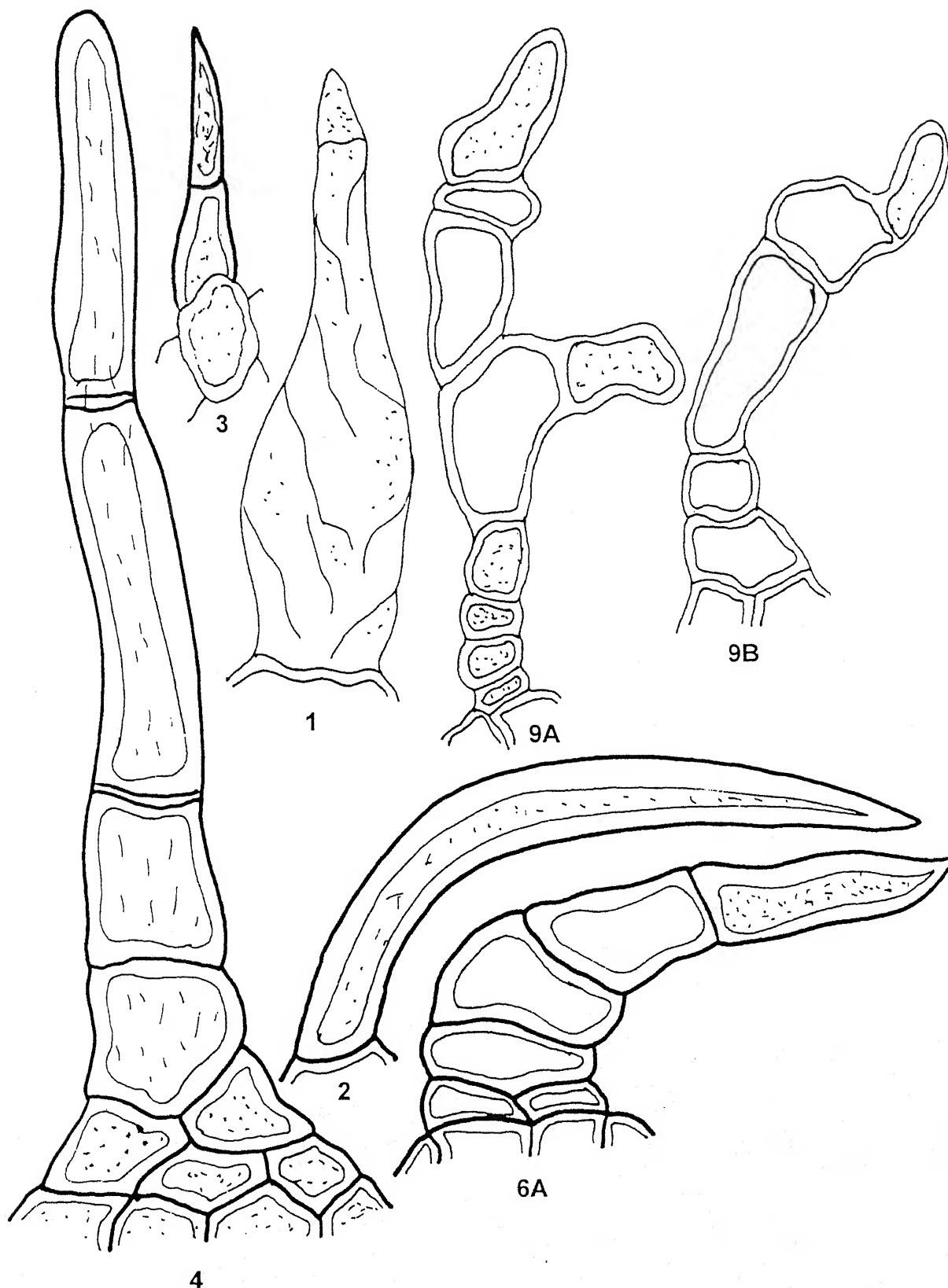
**Distb. :** Petals,

## EXPLANATION OF PLATE- 4

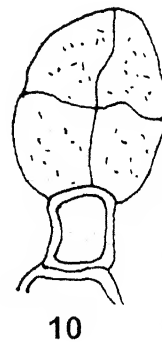
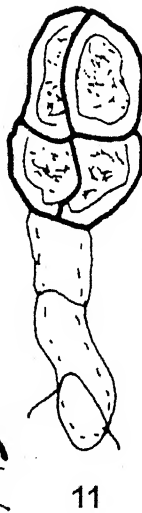
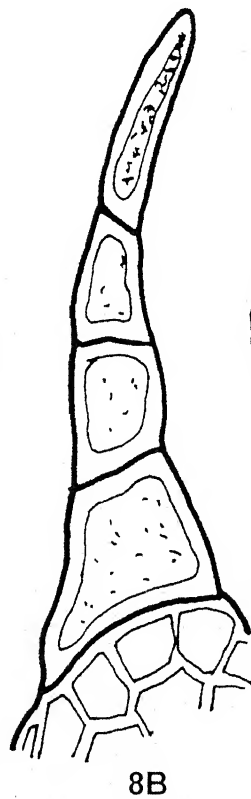
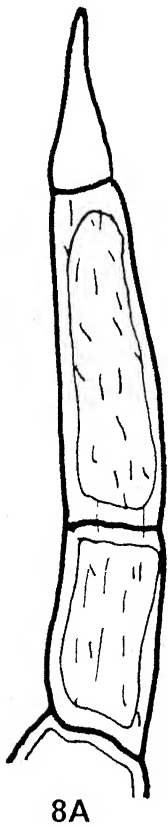
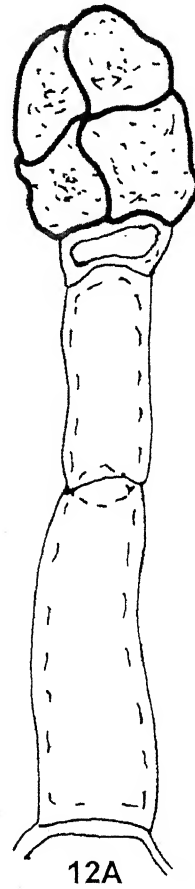
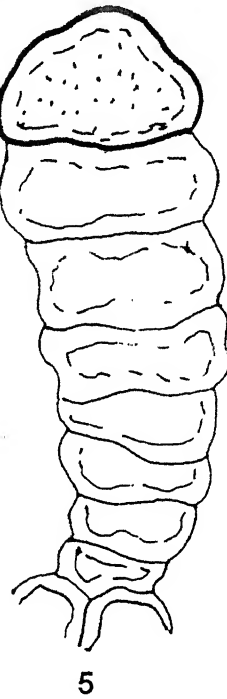
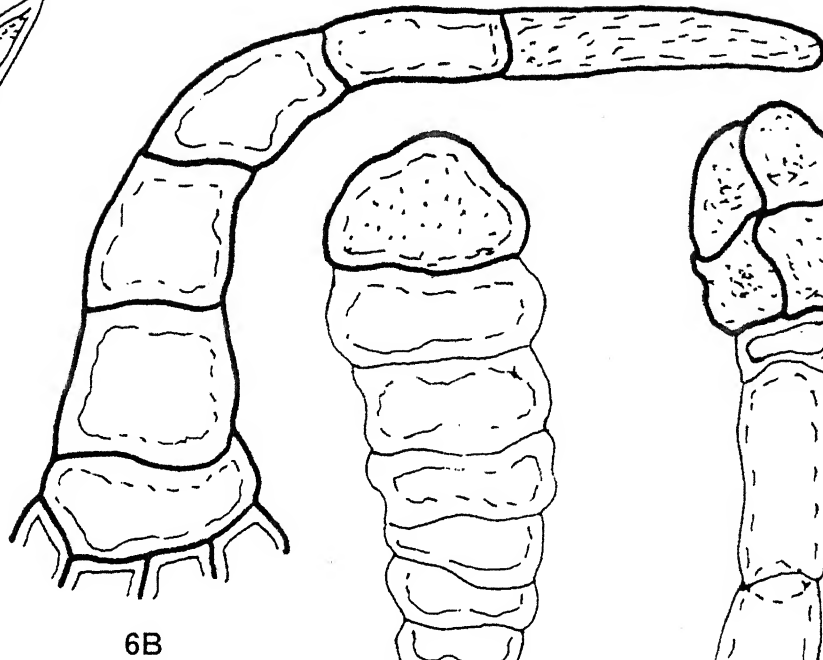
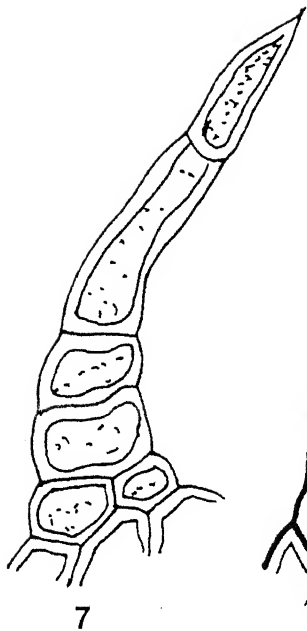
Fig. No.	Trichome Type	Mgn.
1.	Unic. Papillose	H x 5
2.	Unic. Conical	H x 10
3.	Bic. Conical	H x 5
4.	Unis. Filiform	L x 10
5.	Unis. Cylindrical	H x 5
6.	Unis. Hooked	H x 5
7.	Unis. Curved	H x 5
8.	Unis. Conical	H x 5
9.	Unis. Sept. Flagellate	H x 10
10.	Unic. Gld. 4-celled Cap.	H x 10
11.	Bic. Gld. 4-celled Cap.	H x 10
12. A.	Unis. Gld. 4-celled cap.	H x 5
13. B.	Unis. Gld. 4- celled Gld.cap.	H x 10



# PLATE-4A



# PLATE-4B



**6. Uniseriate Hooked : (Code I )**

Foot: Compound. Body: multi cellular, differentiated, hooked; proximal part simple or bulbous; cells of varying size; cross wall simple or geniculate; tip cell long ending obtuse or acute; content dense, granulated, yellow. (Fig. 6)

**Distb. :** Stem , Tendril, Petiole and Pedicel.

**7. Uniseriate curved : (Code J )**

Foot: Compound, emarginate. Body: 3-5 celled, very small, curved; upper cells longer than breadth; tip cell acuminate; walls thick, content dense, yellow, granulated. (Fig. 7 )

**Distb. :** Tendril, Pedicel , Sepals and Ovary.

**8. Uniseriate conical : (Code K )**

Foot: Simple or Compound. Body: 3-4 celled, entire or differentiated, conical; basal cell simple or bulbous; tip cell hyaline acuminate or oblong; lateral wall thick; lumen narrow, content yellowish granulated. (Fig. 8A & 8B)

**Distb. :** Stem , Petiole, Leaf, Pedicel , Sepals.

**9. Uniseriate Septate Flagellate : (Code L )**

Foot: Compound . Body: many celled, irregular, hyaline, flagellate; branched or unbranched; cells of varying outline ; lateral & cross wall thin ; content translucent. (Figs. 9A & 9B )

**10. Unicellular Gld. 4-celled Capitate : (Code R )**

Foot: Simple. Body : Differentiated ; stalk 1-celled, cell isodiametrical ; head 4-celled, globose; content dense, granulated , and yellow . (Fig. 10 )

**Distb. :** Leaf, Sepal, Petal and Stamens.

**11. Bicellular Gld. 4-celled Capitate : (Code T )**

Foot: Simple . : Body : Differentiated ; Stalk 2 -celled, cells thin walled, head oblong, 4-celled; wall thick; content dense, granulated. (Fig. 11)

**Distb.** : Tendril, Sepals, Petals .

**12. Uniseriate Gld. 4-celled Capitate : (Code W)**

Foot: Simple. Body: Differentiated; stalk 3-celled, filiform, lower cells much longer or all cells very small isodiametrical; lateral wall thin or thick ; head 4-celled, globose with irregular periphery; content dense, granulated (Fig. 12A & 12B)

**Distb.** : Stem, Leaf, Pedicel and Ovary.

**OT U- 5 *Cucumis melo*, Linn.**

**This taxa shows eleven types of trichome ( Plate 5. – Fig. 1-11)**

**1. Unic. Papillose : (Code A1)**

Foot : Simple . Body: 1- celled, inflated, irreguler, hyaline, Papillose; wall thin, infolded ; content transluscent. (Fig. 1)

**Distb. :** Petals, Stamens and Stigma.

**2. Unic. Conical : (Code A II)**

Foot: Compound , cupular. Body: 1-celled , entire, errect, conical; basal part bulbous, terminal part gradually tapering to a pointed tip; wall thick, lumen narrow; content dense yellow. (Fig. 2)

**Distb. :** Stem, Tendril, Petiole, Leaves, Pedicel and Sepals.

**3. Unic. errect : (Code A III )**

Foot: Simple, broad. Body: 1-celled , stout; proximal part broad, distal part curved to a pointed tip; wall thick; content dense granulated. (Fig. 3).

**Distb. :** Stem, Leaves, Sepal and ovary

**4. Bic. Belemnoid : (Code F )**

Foot: Compound, elevated. Body : 2- celled, differentiated; basal cell errect, cylindrical, very long; upper cell narrow, acerate, tip sharply pointed; wall thick, lumens narrow; content dense. (Fig. 4)

**Distb. :** Stem, Petiole, Leaves and Pedicel

**5. Unis. Filiform : (Code G)**

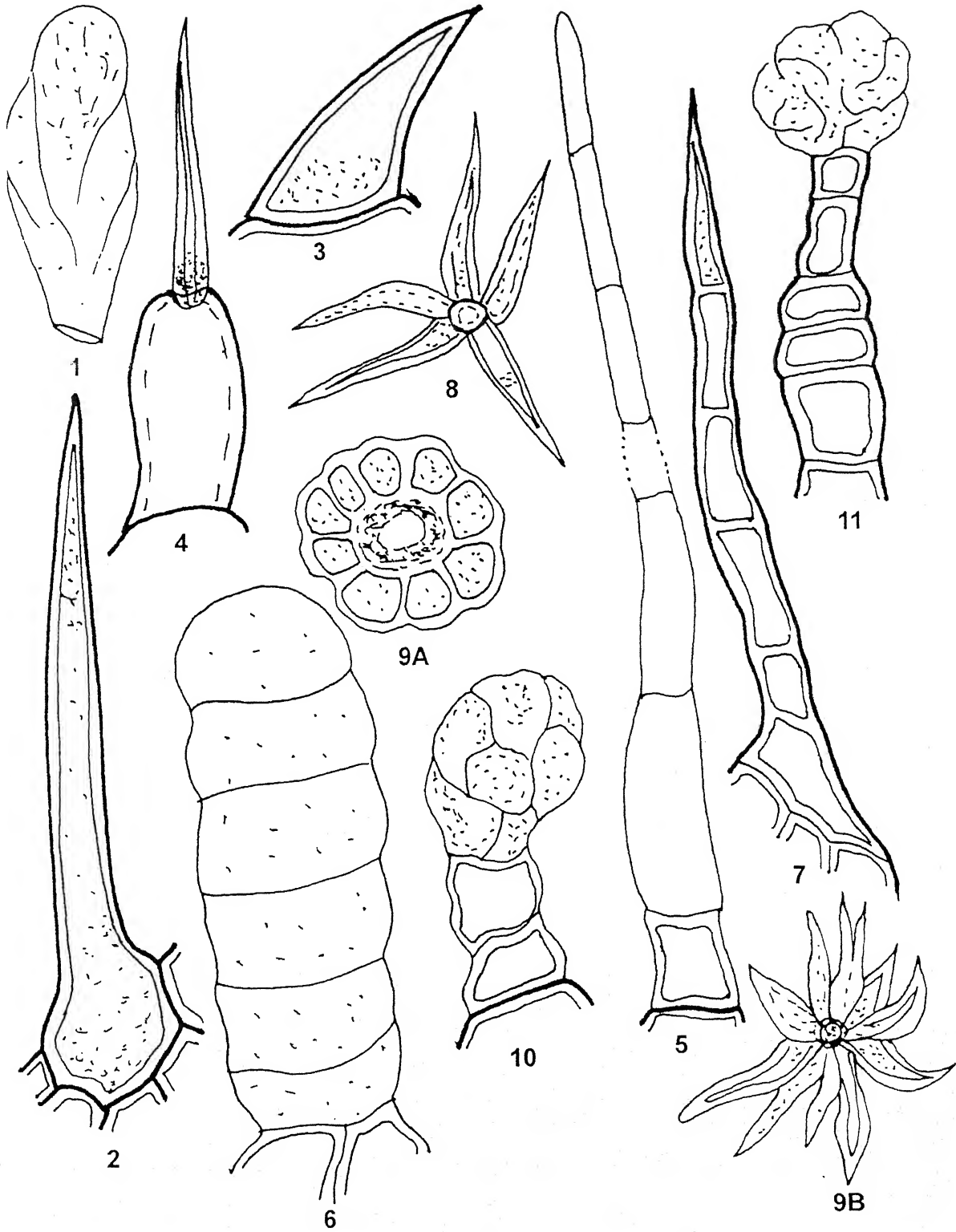
Foot: Simple. Body : Many celled , uniseriate, filiform; proximal cells oblong, distal cell very long, walls thick, tip rounded; content opaque. (Fig. 5)

**Distb. :** Stem, Tendril, Leaves, Sepals.

## EXPLANATION OF PLATE- 5

Fig. No.	Trichome Type	Mgn.
1.	Unic. Papillose	H x 10
2.	Unic. Conical	H x 5
3.	Unic. Arrect	H x 10
4.	Uic. Belemnoid	H x 5
5.	Unis. Filiform	H x 5
6.	Unis. Cylindrical	H x 5
7.	Unis. Conical	H x 5
8.	Stellate	H x 10
9.	Peltate	H x 10
10.	Bic. Gld. M-celled Cap.	H x 10
11.	Unis. Neck-celled. Cap.	H x 5

# PLATE-5



**6. Unis. Cylindrical : (Code H)**

Foot: Compound. Body : 6-8 celled, cells discoid, tip rounded; lateral and cross walls thin; content translucent. (Fig. 6)

**Distb. :** Petals and ovary

**7. Unis. Conical : (Code H)**

Foot: Compound, emarginate. Body: many celled, stiff, straight; basal cell arrect with broad base; terminal cell rigid, conical; tip acute; lateral and cross wall thick, lumen narrow, content dense, granulated. (Fig. 7)

**Distb. :** Stem, Leaves, Pedicel, Sepal and Ovary.

**8. Stellate : (Code N )**

Foot: Not visible. Body: 3-5, radiating , armed; rays unicellular, filiform; tip pointed; lateral wall thick, lumen narrow; content dense, yellow. (Fig. 8)

**Distb. :** Stem, Petiole, Leaves and Pedicel.

**9. Peltate : (Code O)**

Foot: Sunken. Body: Differentiated; having unicellular very short stalk and shield- like circular body or radiating, irregular periphery, cells many, arranged around a porous center; each cell rectangular (Fig. 9A) or acuminate, long, curved with acute tip (Fig. 9B) ; outer walls thick, smooth; content opaque granulated.

**Distb. :** Stem, Leaves and Ovary.

**10. Bic. Gld. M-celled Capitate : (Code U)**

Foot: Simple, emarginate. Body: Differentiated; stalk 2-celled high, cells small, rectangular ; head large, oblong, irregular multicellular; cells inflated ,over lapped and thin walled; content granulated, yellow. (Fig. 10)

**Distb. :** Tendril, Leaves, Sepals, Petals and Ovary.



**11. Unis. Neck- celled Gld. Capitate: (Code Y)**

Foot: Simple . Body: Differentiate; stalk multicellular, uniseriate, irregular; cells rectangular of varying shape; distal cells narrow making neck of the head; lateral and cross walls thick; joint distinct; head multicellular , hyaline, inflated as a infolded rounded body ; wall thin , content golden yellow (Fig. 11)

**Distb. :** Stem, Petiole, Leaves, Sepals and Ovary.

**OTU-6 *Cucumis melo* var. *momordica*, Duthie**

**This taxa shows ten types of trichome (Plate-6 Fig. 1-10)**

**1. Unic. Papillose: (Code A1)**

**Foot:** Simple. Body: 1-celled, hyaline, very long, clavate shaped, entire, papillose; wall thin, smooth; content, translucent. (Fig. 1)

**Distb. :** Petals, Stamens, Ovary and Stigma.

**2. Unic. Conical: (Code AII)**

**Foot:** Simple. Body: 1-celled, erect, tapering to a pointed tip; wall warty, thin; lumen narrow; content granulated. (Fig. 2)

**Distb. :** Tendril, Sepals, Petals and Ovary.

**3. Bic. Conical: (Code D)**

**Foot:** Simple, elevated. Body: Differentiated; basal cell bulbous, upper part curved; terminal cell long, conical, tip acute; lateral and cross wall thick; content granulated yellow. (Fig. 3)

**Distb. :** Stem, Petiole, Leaves and Sepals.

**4. Bic. Aseptate Flagellate: (Code E)**

**Foot:** Compound. Body: 2-celled, differentiated; basal cell rectangular; upper cell very long, flagellated; wall normal; content opaque. (Fig. 4)

**Distb. :** Tendril, Leaves, Sepals and Petals.

**5. Unis. Filiform: (Code G)**

**Foot:** Simple. Body: 4-7 celled, long, filiform; cells columnar; joint distinct; lateral wall smooth; content granulated. (Fig. 5)

**Distb. :** Stem, Petiole, Leaves and sepals.

## EXPLANATION OF PLATE- 6

Fig. No.	Trichome Type	Mgn.
1.	Unic. Papillose	H x 10
2.	Unic. Conical	H x 10
3.	Bic. Conical	H x 10
4.	Bic. Asept. Flagellate	H x 5
5.	Unis. Filiform	L x 10
6.	Unis. Hooked	H x 5
7.	Unis. Belemoid	H x 5
8.	Unic. Gld. 4-celled Cap.	H x 10
9.	Bic. Gld. 2-celled. Cap.	H x 10
10.	Unic. Gld. 2-celled. Cap.	H x 10

# PLATE-6

Mgn.

H x 10

H x 10

H x 10

H x 5

L x 10

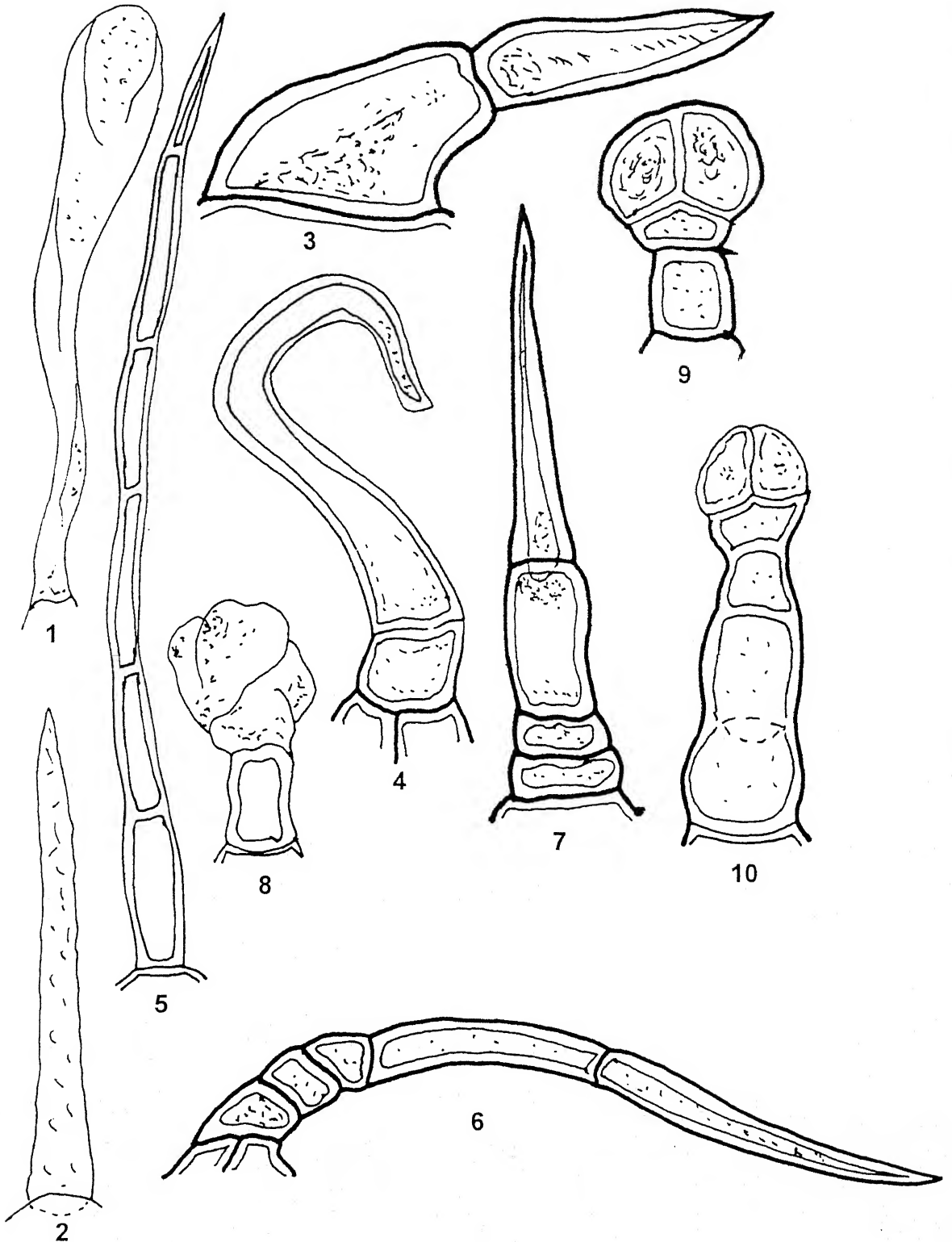
H x 5

H x 5

H x 10

H x 10

H x 10



**6. Unis. Hooked. : (Code I)**

**Foot:** Compound, emarginate. Body: 4-5 celled , Differentiated; proximal 2-3 cells rectangular, small, making rigid stalk; rest upper cell columnar, long, terminal cell tapering to a curved , pointed end; joint distinct; wall rigid, content granulated yellow. (fig. 6)

**Distb. :** Stem , Leaves, Pedicel , and Sepals.

**7. Unis Belemnoid: (Code M)**

**Foot:** Simple. Body: 4-5 celled, differentiated; basal region consist disceid cells; sub terminal cell oblong; terminal cell long, conical, stiff erect; walls thick; content dense, granulated golden yellow. (Fig. 7)

**Distb. :** Stem Tendril, Petiole and Pedicel.

**8. Unic. Gld. 4-celled Capitate: (Code R)**

**Foot:** Simple. Body: differentiated; stalk 1- celled, oblong; head 4-celled , inflated and hyaline; content granulated , opaque. (Fig. 8)

**Distb. :** Tendril, Sepals, Petals, ovary , Stigma, Stamens.

**9. Bic. Gld. 2-celled Capitate: (Code S)**

**Foot:** Simple. Body: Differentiate; stalk 2-celled, basal cell oblong, upper cell collard; head globose of 2 hemi spherical cells; content yellow. (Fig. 9)

**Distb. :** Tendril , Pedicel, Sepals.

**10. Unis. Gld. 2-celled Capitate: (Code V)**

**Foot:** Simple. Body: Differentiated ; stalk 4-celled, erect; proximal cells cylindrical, bulbous; distal cells rectangular; head globose of 2 hemi spherical cells. (Fig. 10)

**Distb. :** Stem, Petiole, Leaves and Pidicel.

**OUT -7 *Cucumis melo* var. *utilissimus*, Duthie & Fullar**  
**This taxa shows ten types of Trichome (plate 7, Fig. 1-11)**

**1- Unic. Papillose: (Code A1)**

**Foot:** Simple. **Body:** 1- celled, hyaline, Variously shaped; wall thin, inflated, content transluscent. (Fig. 1)

**Distb. :** Petals and Stigma.

**2. Bic. Belemnoid: (Code F)**

**Foot:** Simple. **Body:** differentiated; basal cell cylindrical, oblong; upper cell sharply acuminate , tip pointed; wall thick; lumen narrow, content dense, yellow (Fig. 2)

**Distb.:** Stem, Petiole, Leaves, Tendrils and Sepals.

**3. Unis. Filiform: (Code G)**

**Foot:** Compound. **Body:** 5-8 celled, uniseriate, filiform; cells of varying length ; lateral and cross walls thin; lumen normal content opaque. (Fig.3)

**Distb. :** Abundently present on Stem, Petiole, Leaves, Pedicel and Sepals.

**4. Unis Cylindrical: (Code H)**

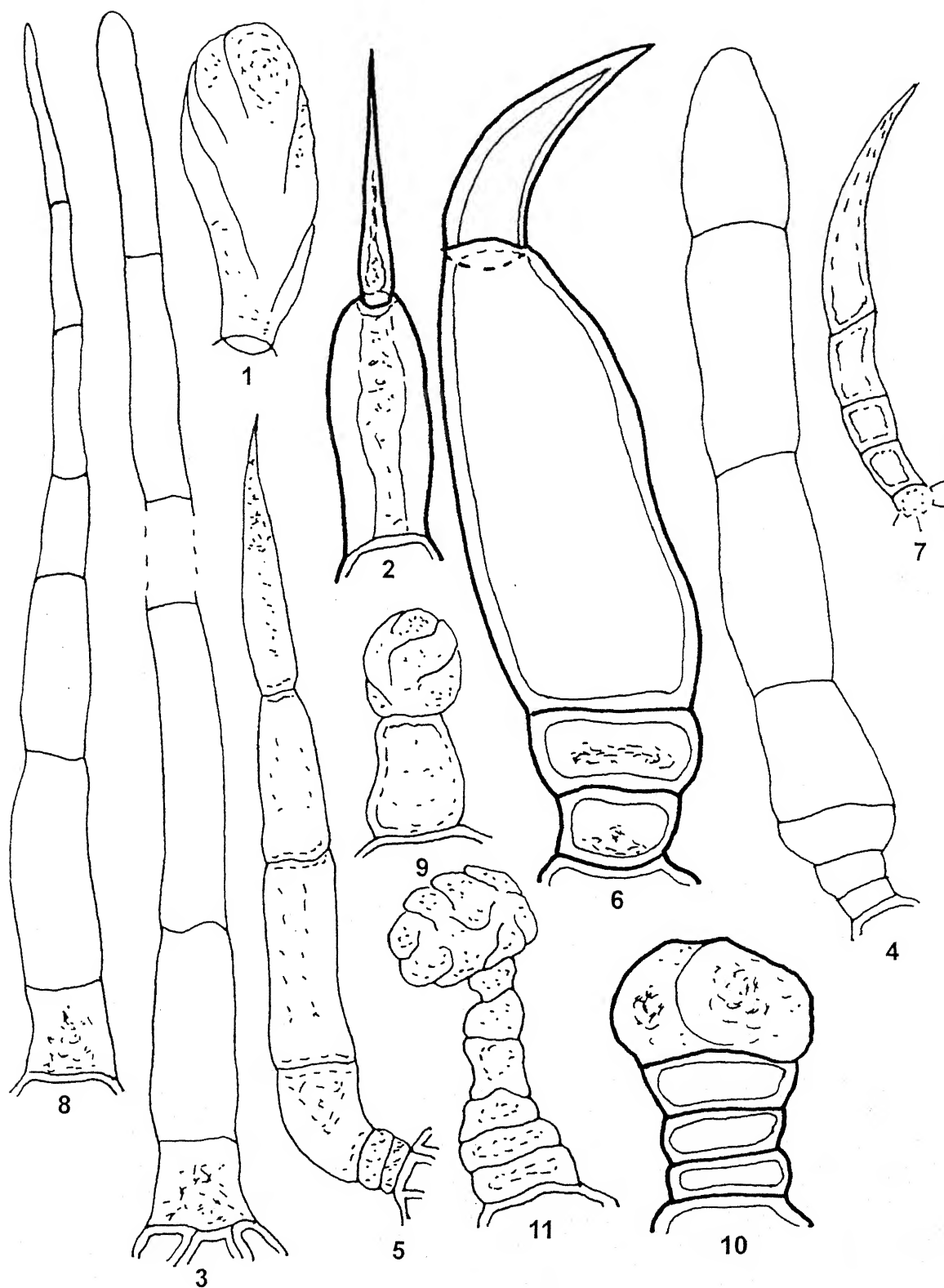
**Foot:** Simple. **Body:** Differentiated; proximal 2-3 cells discoid filled with yellow, granular substance; rest cells oblong, wall thin; tip rounded; content transluscent. (Fig. 4)

**Distb. :** Tendril, Sepals and Petals.

## EXPLANATION OF PLATE- 7

Fig. No.	Trichome Type	Mgn.
1.	Unic. Papillose	H x 10
2.	Bic. Belemoid	H x 10
3.	Unis. Filiform	L x 10
4.	Unis. Cylindrical	H x 5
5.	Unis. Hooked	H x 5
6.	Unis. Curved	H x 5
7.	Unis. Conical	L x 10
8.	Unic. Gld. Cap.	H x 10
9.	Unis. Gld. 2-celled. Cap.	H x 10
10.	Unic. Gld. M-celled. Cap.	H x 10

# PLATE-7





**5. Unis. Hooked : (Code I )**

**Foot:** Simple. Body: Differentiated; basal part 2- celled, cells discoid; rest cells long, narrow (Fig. 5A) or Sub- terminal cell typically very large, oblong (Fig. 5B); terminal cell conical, tip acute; content dense, granulated .

**Distb. :** Stem , Leaves, Ovary (Fig.5A); Petiole, Leaves, Sepals and Ovary (Fig. 5B)

**6. Unis. Curved: (Code J)**

**Foot:** Simple. Body: 3-5 celled, curved; terminal cell longest; tip acute; cross and lateral wall thick, lumen narrow content opaque. (Fig. 6)

**Distb. :** Sepals and Ovary

**7. Unis. Conical: (Code . K)**

**Foot:** Simple. Body: many- celled, very long, erect; tip acute; cells of different length; lateral and cross wall thick content granulated , yellow (Fig. 7)

**Distb. :** Stem, Tendril, Petiole, Leaves and Pedicel.

**8. Unic. Gld. Capitate: (Code P)**

**Foot:** Simple. Body: Differentiate; Stalk 1- celled, cell oblong; head 1- celled, inflated; wall thin, folded; content granulated, dense and yellow. (Fig. 8)

**Distb. :** Petals, Stamens and Stigma.

**9. Unis. Gld. 2- celled Capitate: (Code V)**

**Foot:** Simple. Body: Small, differentiated ; stalk 3- celled, erect; cells discoid; head 2- celled , tomb shaped; outer wall thin, irregular; content granulated, yellow . (Fig.9)

**Distb. :** Leaves, Sepals and Petals.

**10. Unis. Gld. M-celled capitate: (Code X)**

**Foot:** Simple. **Body:** Differentiated; **Stalk** uniseriate, multicellular, cells of varying length & breadth, irregular; **head** multi-cellular, rounded, hyaline; wall thin, irregular; content granulated, yellow. (Fig. 10)

**Distb. :** Leaves, Sepals and Ovary.

**OTU – 8 *Cucumis sativus*, Linn.**

**This taxa shows eleven types of trichome (Plate- 8 , Figs 1-11)**

**1. Unic. Papillose : (Code A I )**

Foot: Simple. Body: 1-celled, hyaline, variously shaped, papillose; wall thin; content granulated, translucent. (Fig. 1)

**Distb. :** Petals, Stamens, Ovary and Stigma.

**2. Unic. Falcate : (Code A V )**

Foot: Simple. Body: 1-celled, falcate shaped; tip acute; wall thick; content dense, granulated. (Fig. 2)

**Distb. :** Tendril, Pedicel, Sepals, Petals and Ovary.

**3. Unic. Cylindrical : (Code A VII )**

Foot: Simple. Body : 1-celled, very long, hyaline, cylindrical; tip rounded; wall thin; lumen wide; content translucent. (Fig. 3)

**Distb. :** Tendril, Leaves, Petals, Stamens and Stigma.

**4. Bic. Conical : ( Code D )**

Foot: Simple . Body: 2-celled, erect, conical ; base bulbous, tip acute; lateral and cross wall thick; content dense. (Fig. 4)

**Distb. :** Stem , Tenril, Petiole, Leaves, Pedicel and Ovary.

**5. Unis. Hooked: (Code I )**

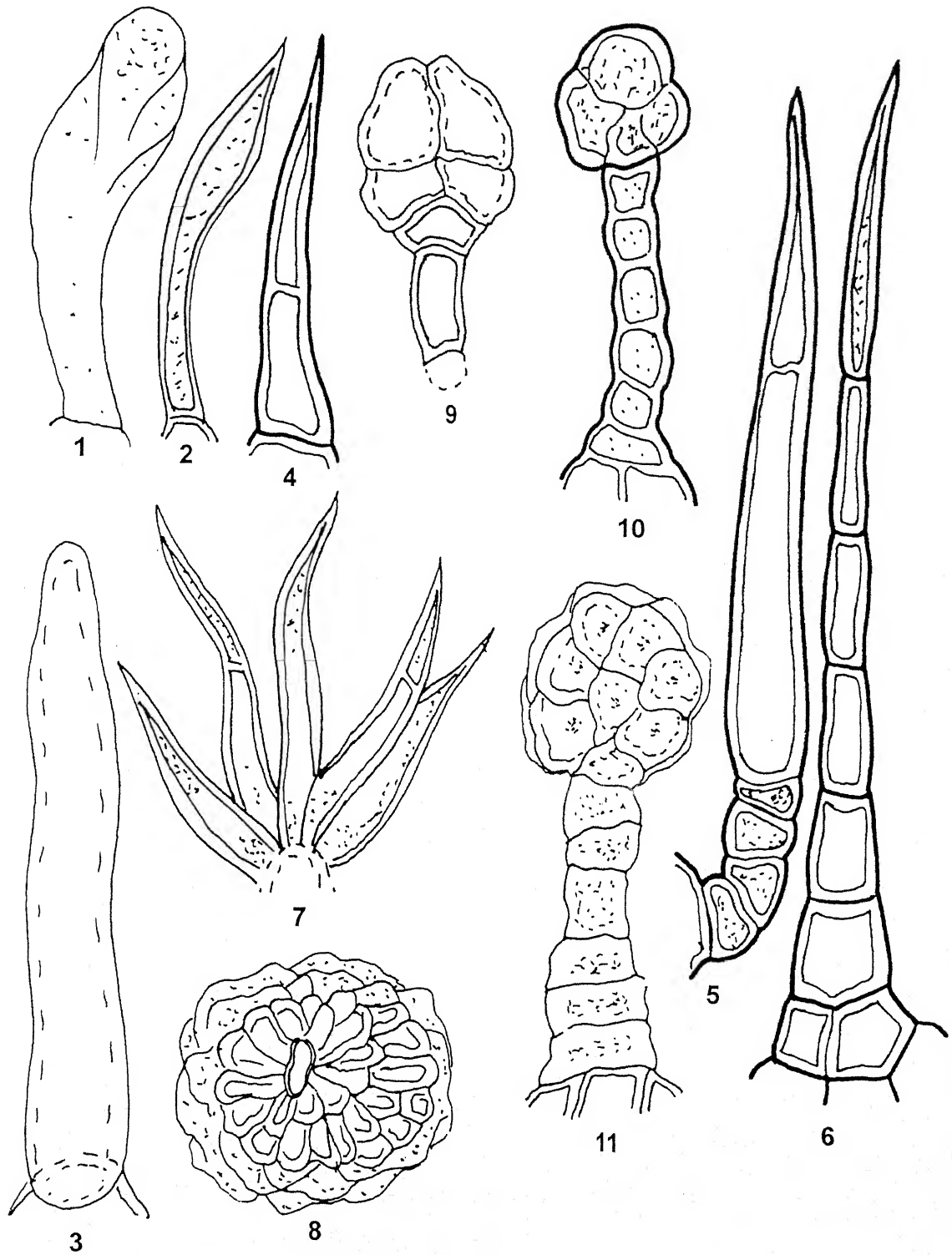
Foot: Simple, elevated. Body: multi cellular, uniseriate hooked, differentiated; proximal cells very small, rectangular or discoid, irregular in outline; joint geniculate; penultimate cell very long, broad, gradually tapering; terminal cell acuminate; lateral and cross walls thick; content opaque. (Fig. 5)

**Distb. :** Stem, Petiole, Leaves, Pedicel and Sepals.

## EXPLANATION OF PLATE- 8

Fig. No.	Trichome Type	Mgn.
1.	Unic. Papillose	H x 5
2.	Unic. Falcate	H x 5
3.	Unic. Cylindrical	H x 5
4.	Bic. Conical	H x 10
5.	Unis. Hooked	H x 5
6.	Unis. Conical	L x 10
7.	Stellate	H x 10
8.	Peltate	H x 10
9.	Bic. Gld. . Cap.	H x 10
10.	Unis. Gld. 4-celled. Cap.	H x 5
11.	Unis. Gld. M- celled. Cap	H x 10

# PLATE-8



**6. Unis. Conical :** (Code K )

Foot: compound, emarginate. Body : 5-8 celled, stiff, erect, conical ; lower cells rectangular ; upper cells longer than broad; terminal cell longest, lanceolate; tip acute; joints distinct; lumen various ; content granulated yellow. (Fig. 6)

**Distb. :** Stem , Tendril, Petiole, Leaves and Sepals.

**7. Stellate :** (Code N )

Foot: Not visible, dome shaped. Body: multi radiate; rays lanceolate or conical, unicelled or bicelled; tip acute; content granulated. (Fig. 7)

**Distb. :** Stem , Petiole, Leave and Pedicel .

**8. Peltate:** (Code O )

Foot: Not visible. Body: multi cellular , 1-celled thick, spherical; cells small, rosettidly arranged; outer wall hyaline, vesiculated, irregular; content granulated opaque. (Fig . 8)

**Distb. :** Stem, Petiole, Pedicel and ovary.

**9. Bic. Gld. 4-celled Capitata :** (Code U )

Foot: Simple. Body : differentiated; stalk 2-celled small lower cell cylindrical, upper cell collard; head multi cellular, globose; wall thin, undulating; content granulated opaque. (Fig. 9)

**Distb. :** Leaves, Sepals, Petals, stamens and ovary.

**10. Unis. Gld. 4-celled capitate :** (Code W )

Foot: compound, emarginated. Body: Differentiated; stalk 5-6 celled, small ; cells small , rectangular; lateral wall torulose, cross wall thick; head 4-celled, globose; outer wall entire; content granulated. (Fig. 10)

**Distb. :** Stem, Leaves, Pedicel and Sepals.

**11. Unis. Gld. M-celled capitate : (Code X)**

Foot: compound. Body: Differentiated; stalk 6-8 celled, irregular erect; cells varied; wall irregular, joint distinct; head multi cellular, globose; outer wall hyaline, thin and vesiculated; content granulated opaque. (Fig. 11)

**Distb. :** Stem , Petiole, Leaves, Tendril and Petals.

**OTU -9 *Cucumis trigonus*, Roxb.**

**This taxa shows ten types of trichome (Plate 9 Fig. 1-10)**

**1. Unic. Papillose. : (Code A1)**

**Foot:** Simple. Body: 1- celled, broad, cylindrical, hyaline; tip rounded; wall thin, hyaline; content translucent. (Fig. 1)

**Distb. :** Stamen, Stigma and Ovary.

**2. Unic. Arrect : (Code III )**

**Foot:** Compound. Body: 1- celled, basal part broad, sunken; distal part curved to a pointed tip; wall thick; content yellow . (Fig. 2)

**Distb. :** Petiole, Leaves, and Sepal.

**3. Bic. Cylindrical : (Code C)**

**Foot:** Simple. Body: 2- celled, long, cylindrical, entire; cells of equal size; tip rounded; wall thin, smooth content translucent. (Fig. 3)

**Distb. :** Petals and Ovary.

**4. Unis. Filiform : (Code G)**

**Foot:** compound. Body: very long, uniseriate, 6-8 celled; cells gradually narrow, columnar lateral and cross walls thick, smooth; joints distinct; lumen narrow; content opaque. (Fig. 4)

**Distb. :** Stem, Petiole, Leaves, Pedicel and Sepals.

**5. Unis. Hooked : (Code I )**

**Foot:** Simple . Body: 5-6 celled, hooked; proximal two cells rectangular making strong base; rest cells long, curved, apical cell sharply pointed; joint distinct; lumen narrow, content granulated yellow. (Fig. 5)

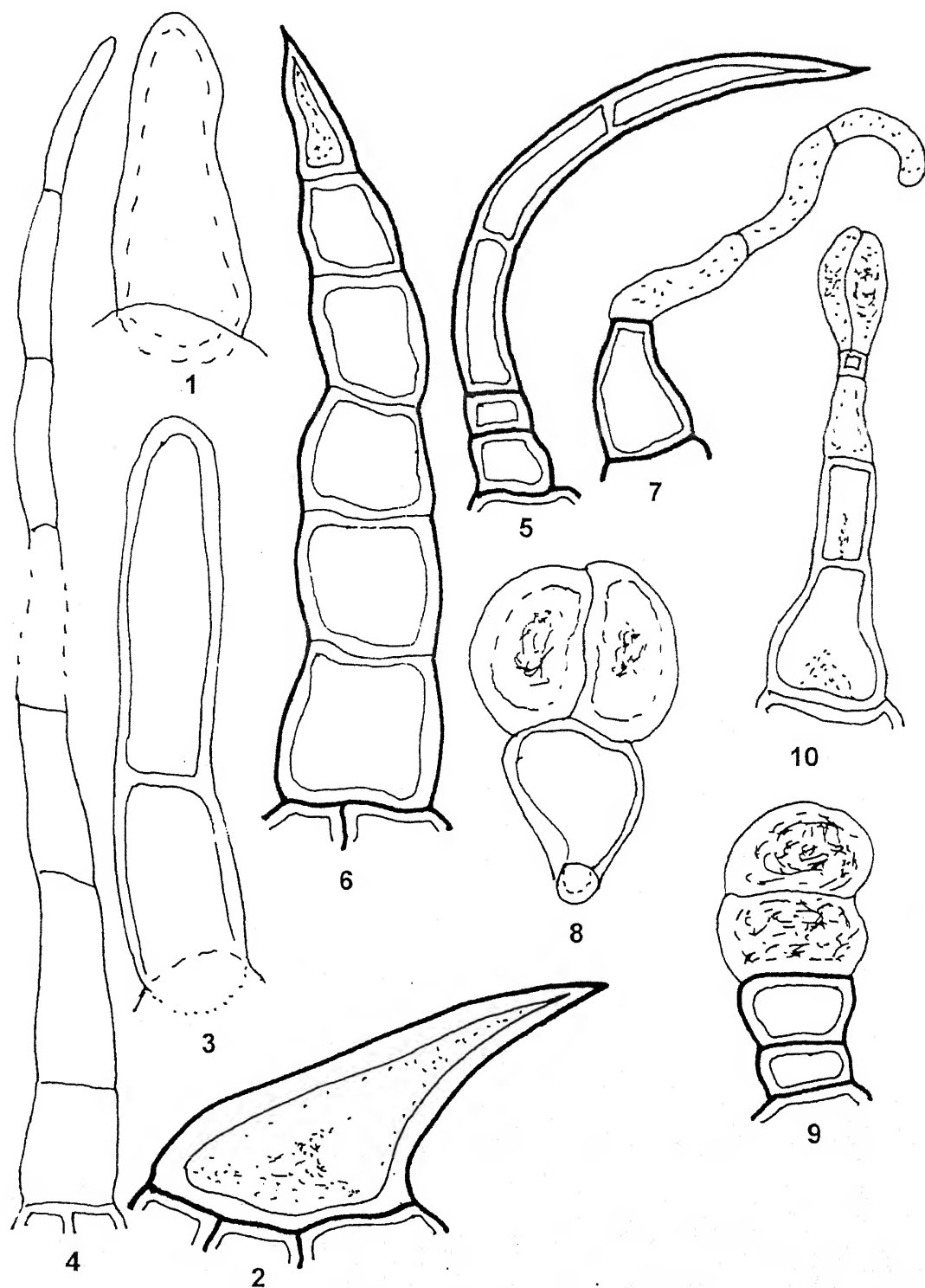
**Distb. :** Stem, Tendril, Petiole, Leaves and Pedicel.



## EXPLANATION OF PLATE- 9

Fig. No.	Trichome Type	Mgn.
1.	Unic. Papillose	H x 10
2.	Unic. Arrect	H x 10
3.	Bic. Cylindrical	H x 10
4.	Unis. Filiform	L x 5
5.	Unis. Hooked	H x 5
6.	Unis. Conical	H x 5
7.	Unis. Sept. Flagellate	H x 5
8.	Unic. Gld. 2-celled Cap.	H x 10
9.	Bic. Gld. 2-celled. Cap.	H x 10
10.	Unis. Neck- celled. Cap.	H x 5

## PLATE-9



**6. Unis. Conical : (Code K)**

**Foot:** Compound. Body : 5-7 celled, conical ; cells barrel shaped, margin undulating; terminal cell smallest, stiffly, acuminate to a sharp pointed end, content of apical cell dense, granulated yellow. (Fig. 6)

**Distb. :** Stem, Leaves and Sepal

**7. Unis. Septate Flagellate: (Code. L)**

**Foot:** Simple. Body: Differentiated; basal cell thick walled, rigid, erect; rest cells very long, thin walled, flagellate, tip rounded; content translucent. (Fig. 7)

**Distb. :** Stem, Sepals, Petals and Ovary .

**8. Unic. Gld. 2-celled Capitate: (Code Q )**

**Foot:** Not visible. Body: Differentiated; stalk 1- celled, clavate; head 2- celled; cell isobilateral, hemi Spherical; content golden yellow. (Fig. 8)

**Distb. :** Tendril, Sepal and Petals.

**9. Bic. Gld. 2-celled Capitate: (Code S)**

**Foot:** Simple. Body: clavate; stalk 2-celled, cells rectangular, simple; head 2-celled, cells bulbous, large, one above the other; terminal cell. ovovate; margin irregular; tip rounded; content granulated yellow (Fig. 9)

**Distb. :** Stem, Leaves and Sepals.

**10. Unis. Neck – celled Gld. Capitate: (Code Y)**

**Foot:** Simple. Body: Differentiated; Stalk 4-5 celled , terminated with smallest, neck cell; head 2- celled seated on neck cell; each cell long , clavate; content granulated yellow. (Fig. 10)

**Distb. :** Stem , Petiole, Leaves and Pedicel.

**OTU -10 *Cucurbita maxima*, Duch.**

**This taxa shows eleven type of trichomes (Plate- 10. Fig. 1-11)**

**1. Unic. Papillose: (Code A1)**

**Foot:** Simple, **Body:** Simple, 1-celled , Papillose, hyaline; wall very thin, irregular with infoldings ; content transluscent. (Fig.1 )

**Distb. :** Stamen, Ovary, Stigma.

**2. Bic. Conical: (Code D)**

**Foot:** Simple . **Body:** 2- celled, erect; cells of equal length, terminal cell Stem, pointed; lumen normal, content opaque.

**Distb.:** Leaves, and Pedicel

**3. Bic. Belemnoid: (Code F)**

**Foot:** Simple, emarginate. **Body:** Differentiated; basal cell barrel – shaped; upper cell stiff, erect , conical, dart-shaped; lumen narrow; content dense, grannulated yellow. (Fig. 3)

**Distb. :** Stem , Petiole, Leaves, Pedicel, Sepals.

**4. Unis. Conical: (Code K)**

**Foot:** compound. **Body :** 4-7 celled, conical ; cells longer than broad; lateral and cross walls thick; content dense yellow. (Fig. 4)

**Distb. :** Stem, Petiole, Leaves, Pedicel , Sepals.

**5. Unis. Hooked: (Code I)**

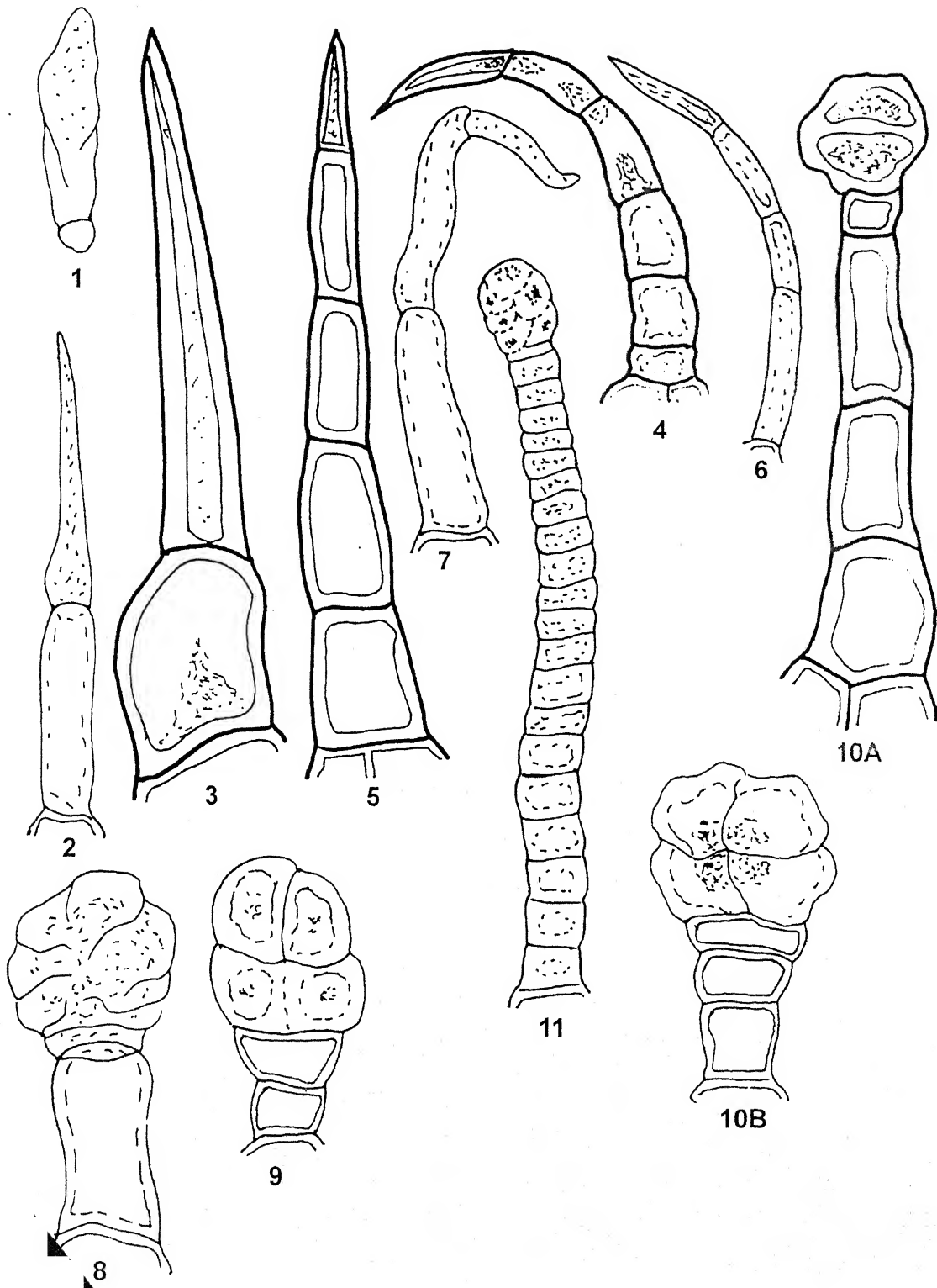
**Foot:** Compound . **body:** 5-7 celled, stiff, hooked; terminal cell longest, and pointed ; lateral and cross walls thick; lumen narrow; content very dense and yellow .(Fig. 5)

**Distb. :** Stem, Leaves and Pedicel .

## EXPLANATION OF PLATE- 10

Fig. No.	Trichome Type	Mgn.
1.	Unic. Papillose	H x 5
2.	Bic. Conical	H x 5
3.	Bic. Belemoid	H x 10
4.	Unis. Hooked	L x 10
5.	Unis. Conical	L x 10
6.	Unis. Curved	L x 10
7.	Unis. Sept. Flagellate	H x 5
8.	Unic. Gld. Cap.	H x 5
9.	Bic. Gld. 4-celled. Cap.	H x 5
10.	Unis. Gld. 4-celled. Cap.	H x 5
11.	Unis. Gld. 4-celled. Cap.	H x 10
12.	Unis. Neck-celled. Cap	L x 10

# PLATE-10



**6. Unis. Curved: (Code J)**

**Foot:** Simple . **Body :** 4-6 celled, entire, curved; cell narrow, tip acute; walls thin and smooth ; content opaque. (Fig. 6)

**Distb. :** Tendril, Pedicel , Sepals and Petals.

**7. Unis. Sept. Flagellate: (Code. L)**

**Foot:** Simple. **Body:** 3-4 celled differentiated; basal cell erect, long; rest indulating, flagellate; wall thin; content translucent. (Fig.7 )

**Distb. :** Petal and Stamen.

**8. Unic. Gland. Capitate: (Code P)**

**Foot:** Simple . **Body:** Differentiated ; stalk 1- celled, cylindrical; wall thick; head globose, inflated , wall thin, hyaline, infolded ; content granulated, golden yellow. (Fig. 8)

**Distb. :** Petals, Stamen, Ovary and stigma.

**9. Bic. Gld. 4-celled Capitate: (Code. T)**

**Foot:** Simple. **Body:** Differentiated; stalk 2- celled high cells rectangular ; head 4-celled , capitate; wall thick ; content dense, granulated yellow. (Fig. 9)

**Distb. :** Leaves, Tendril, Sepal and Petal.

**10. Unis. Gld. 4-Celled Capitate: (Code. W)**

**Foot:** Simple . **Body:** Differentiated; Stalk 3- celled, thin, hyaline; head 4- celled, distinct with dense, granulated yellow contents. (Fig. 10)

**Distb. :** Leaves, Petals and Ovary.

**11. Unis. Neck- celled Gld. Capitate: (Code Y)**

**Foot:** Compound. **Body:** Differentiated ; **Stalk** 3-5 celled , distal cell collard; **head** globose, irregular, 2- celled, cells large, wall thick; content dense, granulated yellow (Fig. 11)

**Distb. :** Petals.



OTU - 11 *Cucurbita pepo*, (L.) Roxb.

This taxa shows twelve types of trichomes (Plate- 11, Figs . 1-12 )

1. **Unic. Papillose** : (Code A 1)

Foot: Simple . Body : Hyaline, variously shaped; wall thin, irregular; content granulated translucent. (Fig. 1)

**Distb.** : Ovary, Stigma and Stamen.

2. **Unic. Flagellate.** : (Code. A VI)

Foot : Simple . Body : Entire, 1-celled, hyaline, thin , flaxible, narrow; contents translucent. (Fig. 2)

**Distb.** : Petals, ovary and stamen.

3. **Bic. Conical** : (Code D)

Foot: Simple. Body: 2-celled, short, conical; upper cell stiff, conical; wall thick; lumen narrow; content dense, granulated and yellow (Fig. 3)

**Distb.** : Tendril, Leaves, Petiole, Sepal.

4. **Unis. Filiform** : (Code G )

Foot: Simple. Body: 3-5 celled, thin, filiform; cells longer than broad; wall normal, content translucent. (Fig. 4)

**Distb.** : Tendril, Leaves, Sepal and Petal.

5. **Unis. Conical** : (Code K )

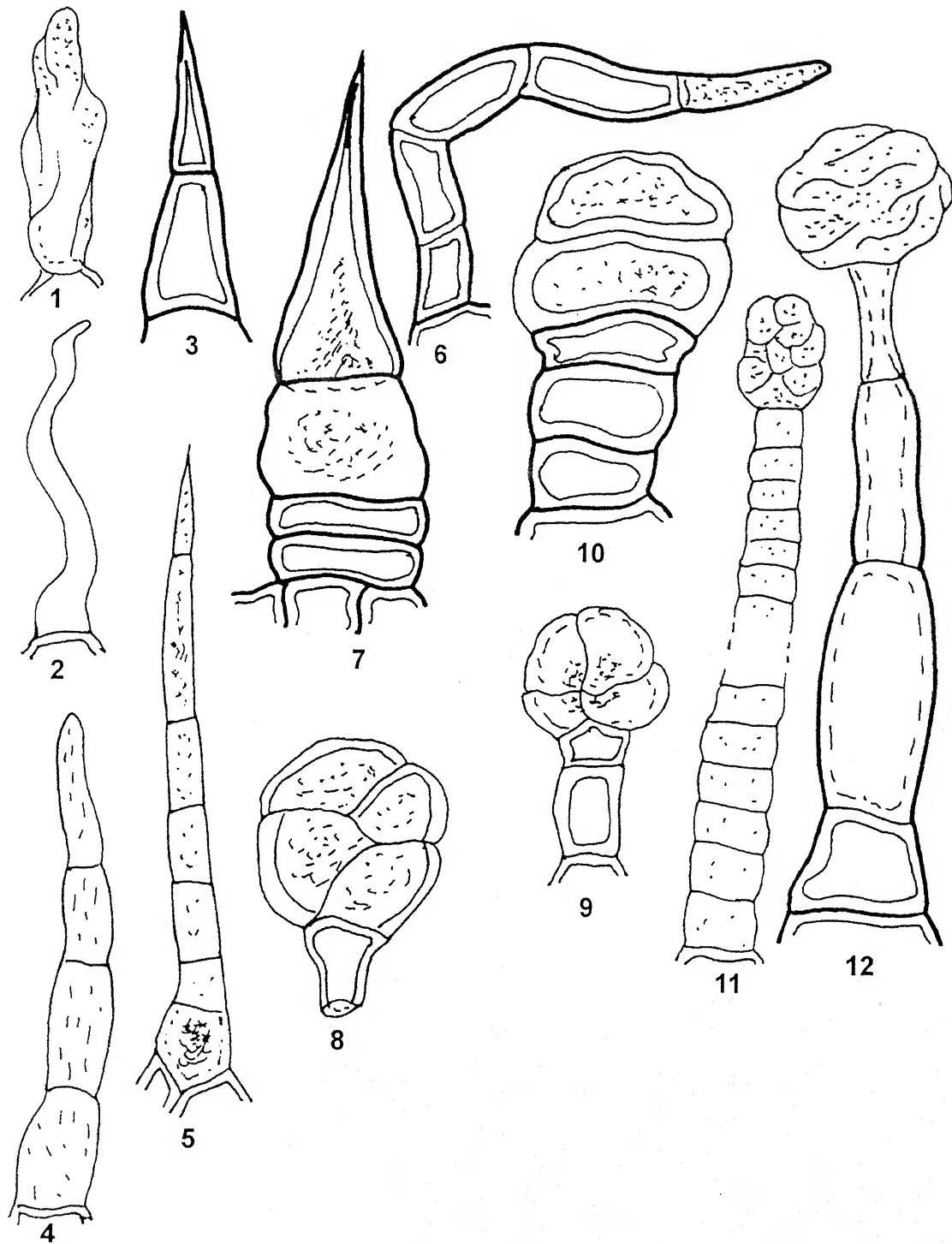
Foot: Compound, emarginated. Body: 4-7 celled, stiff, erect; content dense, granulated, golden yellow. (Fig. 5)

**Distb.** : Stem, Leaves, Pedicel, Sepal.

## EXPLANATION OF PLATE- 11

Fig. No.	Trichome Type	Mgn.
1.	Unic. Papillose	H x 5
2.	Unic. Flagellate	H x 5
3.	Bic. Conical	H x 5
4.	Unis. Filiform	H x 5
5.	Unis. Conical	H x 5
6.	Unis. Hooke	H x 5
7.	Unis. Belemoid	H x 10
8.	Unic. Gld. 4-celled. Cap.	H x 10
9.	Bic. Gld. 4-celled. Cap.	H x 10
10.	Unis. Gld. 2-celled. Cap.	H x 10
11.	Unis. Gld. M-celled. Cap.	H x 5
12.	Unis. Neck-celled. Gld. Cap.	H x 5

# PLATE-11



**6. Unis. Hooked : (Code I)**

Foot : Simple . Body: 5-6 celled; proximal cells erect, distal cells curved, terminal cell conical with dense granulated yellow. (Fig. 6)

**Distb.** : Stem , Tendril, Petiole, Pedicel , Sepal .

**7. Unis. Belemnoid : (Code . M)**

Foot: Compound. Body: Differentiated; all cell except terminal one discoid; terminal cell stiff, acuminate having thick wall; lumen narrow; content dense golden yellow. (Fig. 7)

**Distb.** : Stem , Leaves, Pedicel, Sepal.

**8. Unic. Gld. 4-Celled Cap. : (Code R)**

Foot : Simple . Body: Differentiated ; stalk 1-celled , hyaline; head 4-celled, enlarged, inflated , hyaline; content dense yellow. (Fig. 8)

**Distb.** : Ovary, Stigma.

**9. Bic. Gld. 4-Celled Cap. : (Code T)**

Foot: Simple. Body : Differentiated; stalk 2-celled, cells mequal; head 4-celled , globose; walls thick; content dense, granulated. (Fig. 9)

**Distb.** : Stem, Tendril, Leaves and Sepal.

**10. Unis. Gld. 2-celled Capitulate: (Code V)**

Foot: Simple . Body : entire, glandulate; stalk 3 – celled, erect; cells discoid; head 2-celled, hemi spherical; walls thick; content dense yellow. (Fig. 10)

**Distb.:** Tendril, Pedicel, Sepal and Petal.

**11. Unis. Gld. M-celled Capitulate : (Code X )**

Foot: Simple . Body: Long, cylindrical, differentiated; stalk many celled, long, flexible; cells short, discoid; head many celled, inflated; wall thin, irregular; content dense, granulated. (Fig. 11)

**Distb. :** Petals.

**12. Unis. Neck – celled Gld. Capitulate : (Code Y )**

Foot: Simple. Body : Differentiated ; stalk 3-5 celled, terminal one narrow, necked; head globose , inflated, many celled; content dense, yellow . (Fig. 12)

**Distb. :** Stem, Leaves, Pedicel, Sepal.

OTU - 12 - *Cucurbita moschata*, Duche.

This taxa shows ten types of trichome (Plate ,12. Figs 1-10 )

1. **Unic. Conical** : (Code A II )

Foot: Not visible. : Body: 1-celled, erect, stiff , acuminate; tip pointed ; wall thick; lumen narrow, content granulated. Yellow. (Fig. 1)

**Distb.** : Stem , Petiole, Leaves , Pedicel and Sepals.

2. **Bic. Belemnoid** : (Code F )

Foot: Simple, emarginate. Body : 2-celled, differentiated; basal cell barrel shaped; terminal cell stiff, erect, conical; joint distinct; lateral walls thick; lumen narrow; content golden yellow . (Fig. 2)

**Distb.** : Stem, Tendril, Leaves and ovary.

3. **Unis. Filiform** : (Code G )

Foot: Simple. Body: 5-8 celled, very long , filiform; cells much longer than broad; lateral and cross walls thin ; lumen wide, content opaque . (Fig. 3)

**Distb.** : Stem, Tendril, Petiole, Leaves, Pedicel, Sepals and ovary.

4. **Unis. Cylindrical** : (Code H )

Foot: Simple. Body: 4-6 celled, hyaline, cylindrical; lateral and cross wall thin, tip rounded ; lumen wide, content translucent. (Fig. 4)

**Distb.** : Petals.

5. **Unis. Hooked** : (Code I )

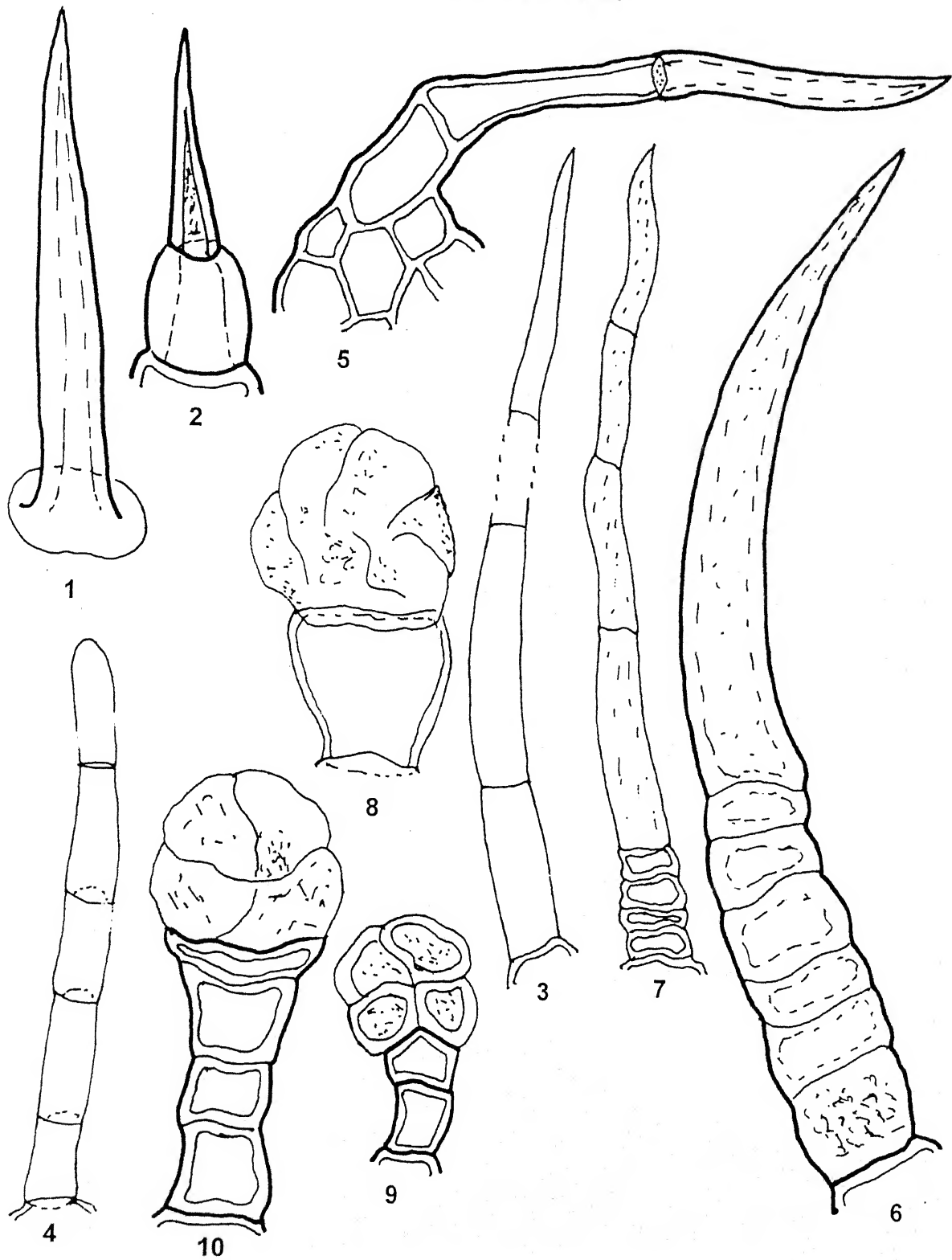
Foot: compound, emarginate. Body : 3-celled, geniculated, stiff, hooked; base compact ; terminal cell longest, tip acute; walls thick ; lumen narrow, content dense, granulated golden yellow. (Fig. 5)

**Distb.** : Stem, Pedicel, Leaves, Pedicel and ovary.

## EXPLANATION OF PLATE- 12

Fig. No.	Trichome Type	Mgn.
1.	Unic. Conical	H x 10
2.	Bic. Belemonid	H x 5
3.	Unis. Filiform	L x 5
4.	Unis. Cylindrical	L x 10
5.	Unis. Hooked	H x 5
6.	Unis. Curved	H x 10
7.	Unic. Sept. Flagellate	H x 5
8.	Unic. Gld. Cap.	H x 10
9.	Bic. Gld. 4-celled. Cap.	H x 10
10.	Unis. Gld. 4-celled. Cap.	H x 10

# PLATE-12





**6. Unis. Curved : (Code J )**

Foot : Simple . Body: Differentiated; except the terminal cell, all cells discoid of varying size; terminal cell very long, curved, gradually tapering to a pointed tip with narrow lumen; content granulated yellow. (Fig. 6)

**Distb. :** Stem , Petiole, Pedicel and Sepals .

**7. Unis. Septate Flagellate : (Code L )**

Foot: Simple. Body : Differentiated; basal region 3-5 celled, dwarf, cells discoid, irregular; rest cells columnar , elongated, flexible; tip pointed; walls smooth; lumen normal, content granulated translucent. (Fig. 7)

**Distb. :** Petals and Ovary.

**8. Unic. Gld. 4-celled Capitate: (Code R )**

Foot: Not visible. Body: Differentiated; stalk 1-celled, hyaline, cupular; head inflated, infolded, multi cellular, hyaline; content granulated translucent. (Fig. 8)

**Distb. :** Stamens , Stigma and Ovary.

**9. Bic. Gld. 4-Celled Capitate : (Code T )**

Foot: Simple. Body: Differentiated; stalk 2-celled, very short, hyaline; head 4-celled, globose; walls thick; content dense, granulated. (Fig. 9)

**Distb. :** Stem , Tendril, and Petals.

**10. Unis. Gld. 4-celled Capitate : (Code W )**

Foot: Simple, emarginate. Body: Differentiated; stalk 3-4 celled, irregular; cells rectangular ; head 4-celled inflated, hyaline; content granulated golden yellow. (Fig.10)

**Distb. :** Stem , Petiole, Leaves and Sepals.

OTU - 13. *Diplocyclos palmatus* (L.) Jaffery

This taxa shows ten types of trichome (Plate 13 Fig. 1-11)

1. **Unic. Papillose** : (Code. AI)

**Foot:** Simple. **Body:** 1- celled, long, Papillose; distal end variably rounded; wall thin; content translucent. (Fig. 1)

**Distb.** : Petals and Ovary.

2. **Unic. Arrect** : (Code A III)

**Foot:** Compound. **Body:** Arrect, distal end Sharply pointed; wall thick and smooth; lumen wide, content yellow (Fig. 2)

**Distb.** : Stem, Petiole and Pedicel.

3. **Unic. Flagellate** : (Code A VI)

**Foot:** Simple. **Body:** 1- celled , flexible, long, narrow; tip rounded; wall thin, hyaline; content translucent. (Fig. 3)

**Distb.** : Tendril, Sepals, Petals, Ovary and Stamens.

4. **Bic. Conical** : (Code D)

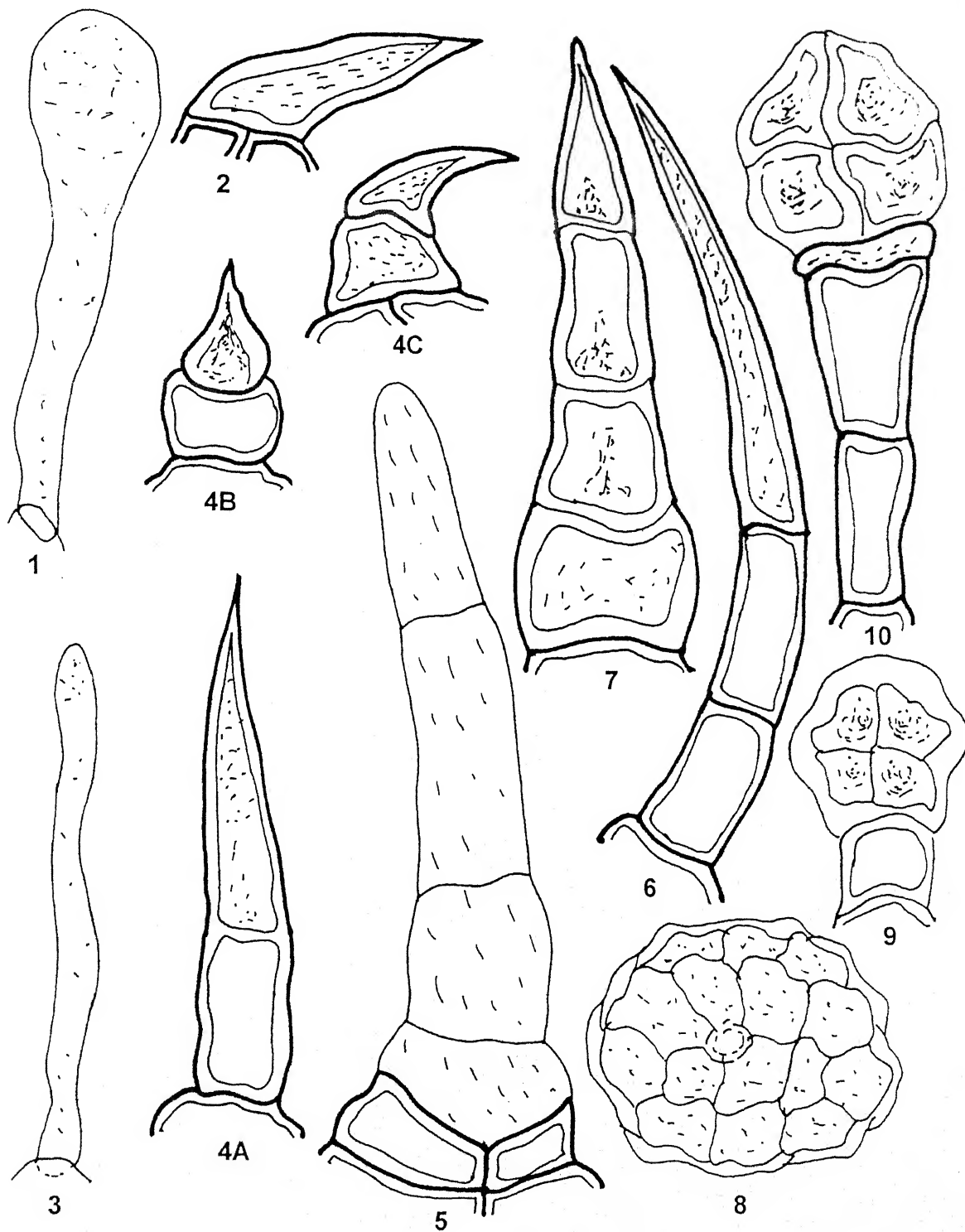
**Foot:** Compound . **Body:** 2- types; I .2-celled, stiff, erect; basal cell oblong, terminal cell long, acuminate; tip acute (Fig. 4A) or II . very stout; cell small, apical cell erect or bent to a hook (Fig. 4B & C) wall thick; content dense, granulated.

**Distb.** : Stem, Petiole, Leaves, Pedicel Sepals and Ovary.

## EXPLANATION OF PLATE- 13

Fig. No.	Trichome Type	Mgn.
1.	Unic. Papillose	H x 5
2.	Unic. Arrect	H x 10
3.	Unic. Flagellate	H x 5
4.	Bic. Conical	H x 10
5.	Unis. Cylindrical	H x 5
6.	Unis. Curved	H x 5
7.	Unis. Conical	H x 10
8.	Peltate	H x 10
9.	Unic. Gld. 4-celled. Cap.	H x 10
10.	Unis. Gld. 4-celled. Cap.	H x 10

# PLATE-13



**5. Unis. Cylindrical:** (Code H)

**Foot:** Elevated, Compound. Body : 4-5 Celled, cylindrical, seated on strong elevated base; basal cell smallest, bulbous; tip rounded; lateral and cross walls normal; content granulated, translucent. (Fig. 5).

**Distb. :** Stem, Petiole and Pedicel.

**6. Unis. Curved :** (Code. J)

**Foot:** Simple. Body: 3- celled, curved; terminal cell longest, gradually tapering to acute apex; lateral and cross wall thick; lumen wide, content dense, granulated.(Fig. 6)

**Distb. :** Stem, Leaves and Sepals

**7. Unis. Conical :** (Code K)

**Foot:** Simple, broad . Body: 4-5 celled, erect, conical; cells rectangular, basal cell broadest, apical cell pyramidal, tip acute; lateral and cross wall thick; content granulated. (Fig. 7)

**Distb. :** Stem and Leaves.

**8. Peltate :** (Code O)

**Foot:** Not visible. Body: many celled, 1- cell thick; parallel to epidermis; cells arranged around the periphery of central hollow region; outer wall thin, vesiculate; content granulated dense.(Fig.8)

**Destb. :** Leaves and ovary.

**9. Unic. Gld.4-Celled Capitate:** (Code R)

**Foot:** Simple. Body: Differentiated; stalk 1- Celled, cell small, rectangular; head 4-celled; cells irregular; outer wall thin, vesiculate; content golden yellow (Fig. 9)

**Distb. :** Stem, Tendril, Leaves, Sepals, Petal and Ovary.

**10. Unis. Neck - celled Gld. Capitate: (Code. Y)**

**Foot:** Simple. **Body:** Differentiated; stalk 3-celled, erect; distal cell discoid, collard; head 4-celled, dolliform; wall thin, vesiculate; content golden yellow (Fig. 10)

**Distb. :** Leaves, Pedicel , Sepals and Petal.

OTU - 14 *Lagenaria vulgaris* ser. in mem"

This taxa shows ten types of trichomes. (Plate No. 14, Figs.1-10)

1. **Unicellular papillose** : (Code A1 )

Foot: Simple, emarginated. Body : entire, hyaline, oblong, tip rounded; lateral wall thin and smooth; lumen wide, content light yellowish. (Fig. 1 )

**Distb.** : Tendril, Leaf, Stamens and ovary.

2. **Unicellular . Falcate** : (Code AV )

Foot: Simple. Body: Entire, opaque, falcate; tip acute; lateral wall thick and rugose; lumen wide, content light yellowish . (Fig. 2)

**Distb.** : Tendril, Petiole, leaf, Pedicel and sepals.

3. **Bicellular Filiform** : (Code B )

Foot : Simple. Body: 2- celled, filiform, both cells equal in length; tip rounded; joint articulate; lateral wall thick, rugose; lumen wide, content opaque. (Fig. 3 )

**Distb.** ; Stem, Leaf, Petiole, Sepals & Petals.

4. **Bicellular Conical** : (Code D)

Foot: Compound, emarginated. Body: 2- celled, conical ; upper cell shorter, tip pointed; lateral wall thick; lumen narrow, content dense, granulated. (Fig. 4 )

**Distb.** : Stem, Leaf, Petiole, Pedicel, and Sepals.

5. **Uniseriate Filiform** : (Code G)

Foot: Simple . Body : 3-6 celled, filiform; cells unequal in length; apical cell longest; cells longer than broad; tip rounded; cross wall thin, lumen wide; content granulated (Fig. 5)

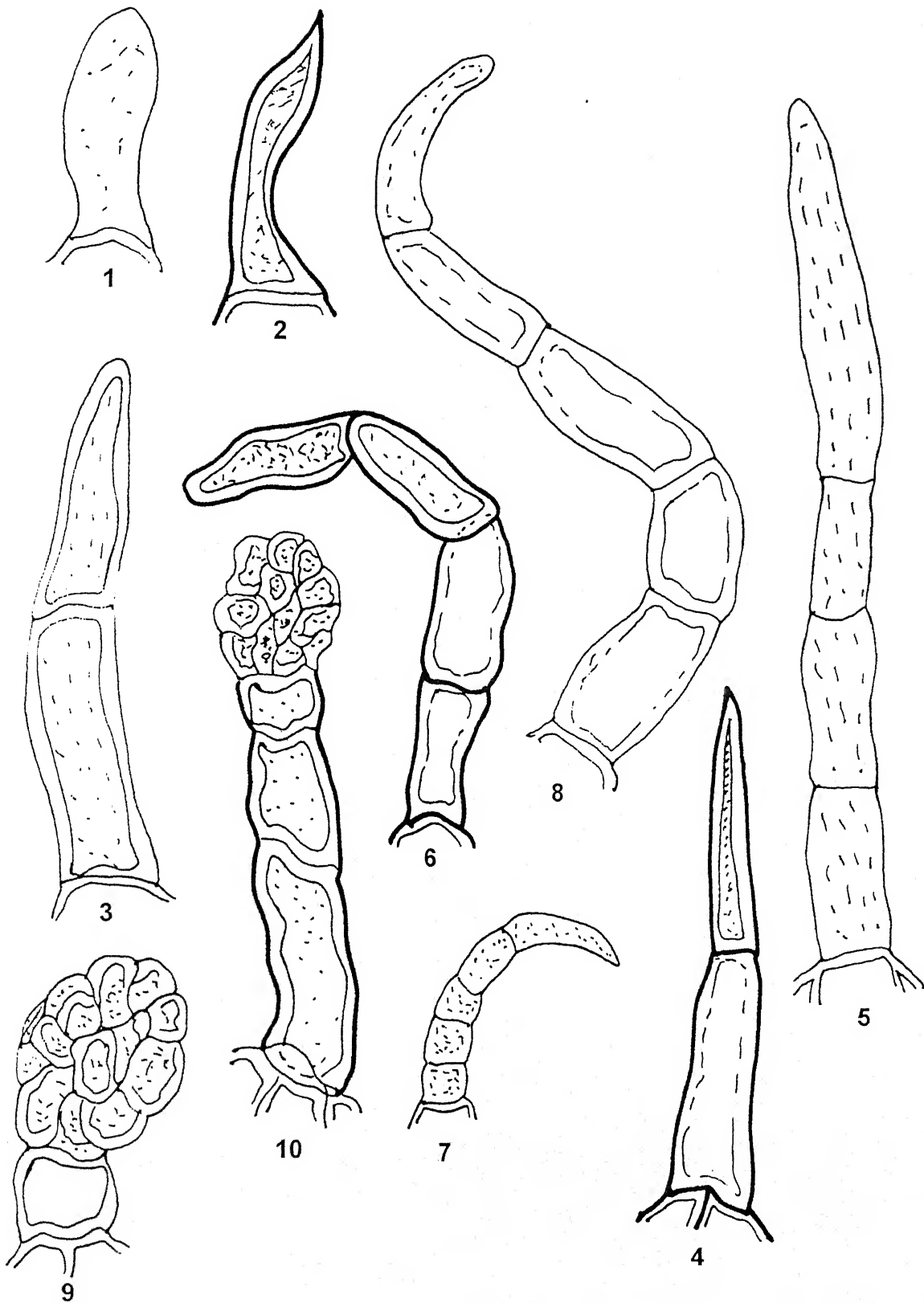
**Distb.** : Stem, Petiole, Leaf and Pedicel .

## EXPLANATION OF PLATE- 14

Fig. No.	Trichome Type	Mgn.
1.	Unic. Papillose	H x 10
2.	Unic. Falcate	H x 10
3.	Bic. Filiform	H x 5
4.	Bic. Conical	H x 5
5.	Unis. Filiform	H x 5
6.	Unis. Hooked	H x 5
7.	Unis. Curved	H x 5
8.	Unic. Sept. Flagellate	H x 5
9.	Unic. Gld. Cap.	H x 10
10.	Unis. Gld. M-celled. Cap.	H x 10



# PLATE-14



**6. Uniseriate Hooked : (Code I )**

Foot: Simple , emarginated. Body: 4-5 celled, hooked, striated; cells almost of equal size; terminal cells filled with dense granulated contents; lateral wall thick; joints articulated; lumen wide, content opaque. (Fig. 6)

**Distb. :** Stem , Petiole, Pedicel and sepals.

**7. Uniseriate curved : (Code J)**

Foot: Simple. Bod: 5-7 celled , curved; cells of different length, terminal longest; tip pointed; lateral wall thin; lumen wide , content opaque , granulated. (Fig. 7)

**Distb. :** Tendril, pedicel, sepals, petals, and ovary.

**8. Uniseriate Septate Flagellate: (Code L )**

Foot: Simple, emarginated. Body: 5-8 celled long; cells much longer than breadth, cylindrical; distal cells flagellate; tip rounded; lateral wall normal, lumen narrow; content yellowish – granulated. (Fig. 8)

**Distb. :** Tendril, Leaf, Petals and ovary.

**9. Unicellular Gld. 4-celled Capitae : (Code R )**

Foot: Compound, emarginated. Body: Differentiated; stalk 1-celled, isodiametricl, wall thick, content opaque; head oval, multi cellular , cells rounded content dense, yellow, granulated .( Fig. 9 )

**Distb. :** Leaf, Petals, ovary and Stigma.

**10. Uniseriate Gld. M-celled Capitae : (Code X )**

Foot : Compound, bulbous. Body : Differentiated; stalk – 3 - 4 celled, upper cell isodiametrical; lateral & cross walls thick, jointed; head multi cellular , rounded; cells of equal size , content dense, granulated. (Fig. 10 )

**Distb. :** Stem, Petiole and pedicel.

OTU – 15 *Luffa acutangula*, L. (Roxb.)

This taxa shows ten types of trichome (Plate 15, Figs. 1-10 )

1. **Unic. Papillose.**: (Code A I )

Foot: Simple. Body: 1-celled, long, irregular, hyaline; variously papillose; wall thin, content translucent . (Fig. 1)

**Distb.** : Leaves, Petals, Stamens, Ovary and Stigma.

2. **Unic. Conical**: (Code A II )

Foot: Compound, emarginate. Body: 1-celled , stout; basal part bulbous; distal part conical; wall thick; content granulated dense. (Fig. 2)

**Distb.**: Stem, Petiole, Pedicel and Sepals.

3. **Unic. Curved** : (Code A IV )

Foot: Simple. Body: 1-celled, stiffly curved; tip acute; wall thick; lumen wide, content dense. (Fig. 3)

**Distb.** : Stem, Tendril , Leaves and Ovary.

4. **Bic. Belemnoid** : (Code F)

Foot: compound, broad. Body: 2-celled, distinct; basal cells very broad, upper cell narrow, acuminate; entire body dart – shaped; wall thick; content granulated opaque. (Fig. 4)

**Distb.** : Leaves, Sepals, Petals and Ovary.

5. **Unis. Filiform** : (Code G )

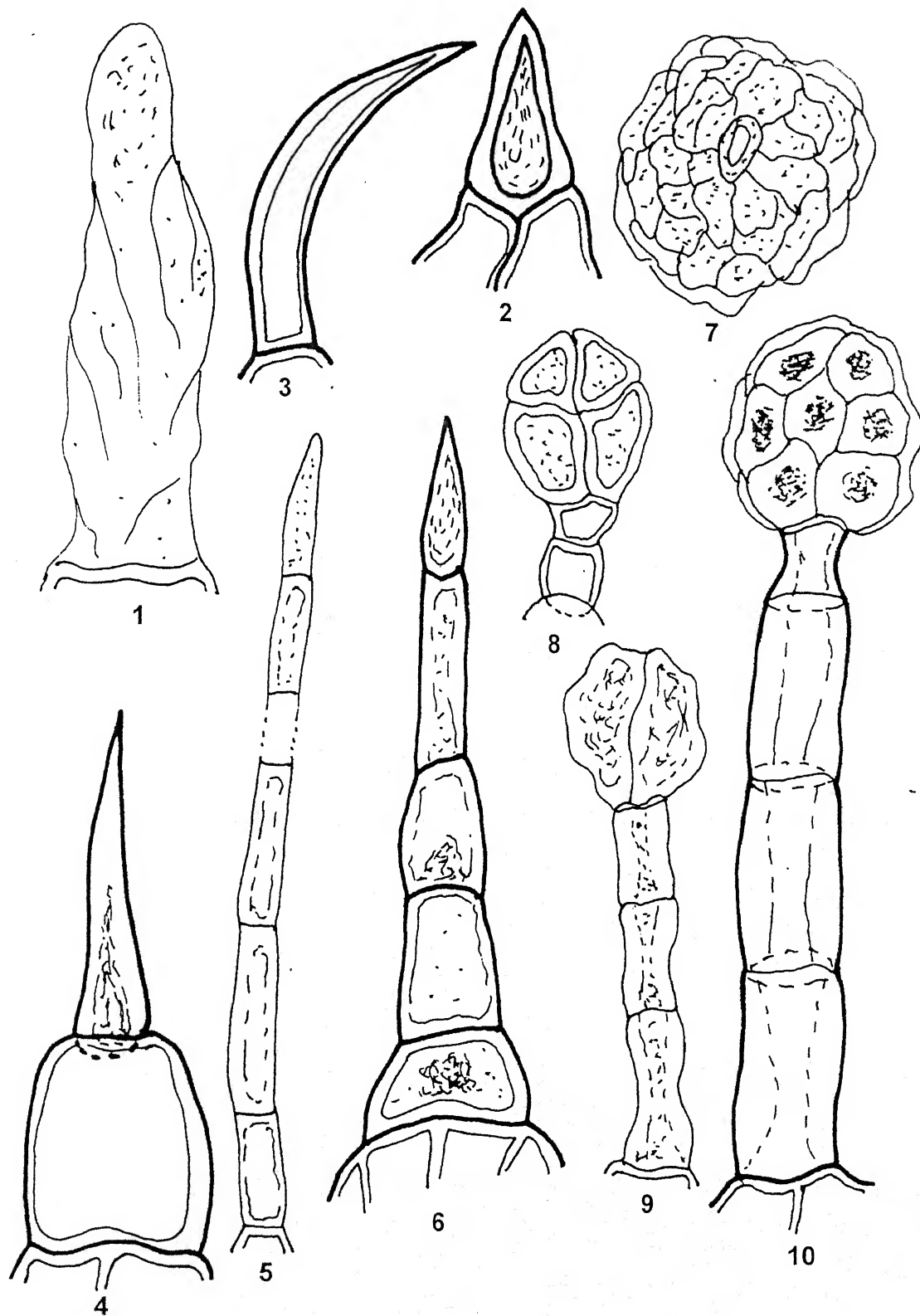
Foot: Simple. Body: 5-8 celled, very long, filiform; cells much elongated; tip retuse; cross walls thin; content granulated (Fig. 5)

**Distb.** : Stem, Petiole, Leaves, Pedicel, Sepals and Ovary.

## EXPLANATION OF PLATE- 15

Fig. No.	Trichome Type	Mgn.
1.	Unic. Papillose	H x 10
2.	Unic. Conical	H x 10
3.	Unic. Curved	H x 10
4.	Bic. Belemonid	H x 5
5.	Unis. Filiform	H x 5
6.	Unis. Conical	H x 5
7.	Peltate	H x 10
8.	Bic. Gld. 4-celled. Cap.	H x 10
9.	Unis. Gld. 2-celled. Cap.	H x 10
10.	Unis. Neck-celled. Gld. Cap.	H x 5

# PLATE-15



**6. Unis. Conical : (Code K )**

Foot: compound , emarginate. Body : 4-6 celled, stiff, erect; cells of various diameter; basal cell broad, bulbous; terminal cells acuminate; content dense, granulated . (Fig. 6)

**Distb. :** Stem, Petiole, Leaves, Pedicel and Ovary.

**7. Peltate : (Code O )**

Foot: Not visible. Body: multi cellular, rossetted, 1-celled thick; cells irregular, hyaline, arranged in manyrings; outer wall thin, vesiculated; content granulated, golden yellow. (Fig. 7)

**Distb. :** Stem, Leaves and Ovary.

**8. Bic. Gld. 4-celled Capitae: (Code . T )**

Foot. Simple . Body: Differentiated; stalk 2-celled, dwarf, cells rectangular, wall thin; head 4-celled, ovate; content dense, granulated, yellow . (Fig. 8)

**Distb. :** Tendril, Leaves, Sepals, Petals, Stamens and Ovary.

**9. Unis. Gld. 2-celled capitae : (Code V)**

Foot: Simple. Body : Differentiated; stalk 3-celled , cells longer than broad; joint distinct, lumen narrow; head 2-celled, isobilateral, elongated cells; content granulated, yellow . (Fig. 9)

**Distb. :** Stem, Petiole, Leaves, Pedicel, Sepals and Petals.

**10. Unis. Neck – celled Gld. Capitae : (Code Y)**

Foot: Compound. Body : Differentiated; stalk 4-5 celled ; terminal cell bi-concave like neck, weak; head multi cellular , spherical; cell in regular fashion; outer wall thin, vesiculated; content granulated golden yellow. (Fig. 10)

**Distb. :** Stem, Petiole, and Pedicel.



OTU - 16 - *Luffa echinata* Roxb.

This taxa shows ten types of trichome (Plate - 16, Fig. 1-10)

1. **Unic. Conical** : (Code A II)

Foot: Simple. Body : 1- celled, entire, still, erect, columnar; tip pointed; lumen narrow ; content yellow. (Fig. 1)

**Distb.** : Stem, Leaves, Pedicel, Petals and Ovary.

2. **Unic. Falcate** : (Code A V)

Foot: Simple. Body: 1- celled, rigid, falcate shaped; tip acute; wall thick; lumen narrow, content dense, yellow (Fig. 2)

**Distb.** : Tendril , Petiole, Leaves, Sepals and Petals.

3. **Bic. Conical** : (Code D)

Foot: Simple. Body: 2-celled, erect, conical ; cells of equal size; upper cell rectangular , tip acute; walls thick; lumen wide; content dense, granulated. (Fig. 3)

**Distb.** : Stem , Leaves, Pedicel, Sepals and Ovary.

4. **Unis. Filiform** : (Code G)

Foot: compound , elevated. Body: 3-4 celled, uniseriate, filiform; tip rounded; cross walls distinct; content granulated. (Fig. 4)

**Distb.** : Tendril, Sepals, Petals, Stemens and Stigma.

5. **Unis. Hooked** : (Code I)

Foot: compound, elevated. Body: 4-5 celled , stiff, curved; terminal cell rigid, conical; lateral and cross walls thick; content granulated yellow. (Fig. 5)

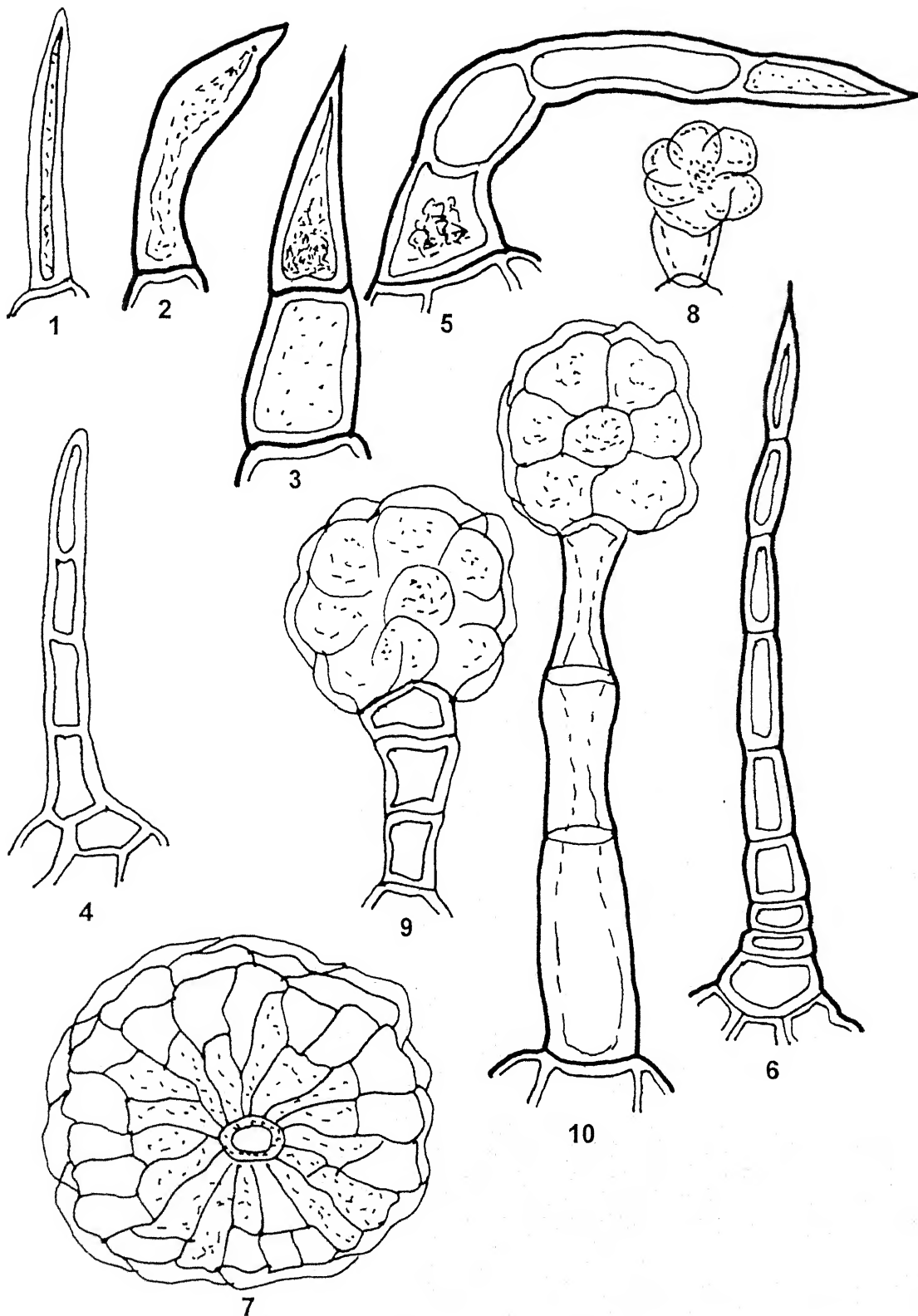
**Distb.** : Stem, Petiole, Leaves, Pedicel and Ovary.

## EXPLANATION OF PLATE- 16

Fig. No.	Trichome Type	Mgn.
1.	Unic. Conical	H x 5
2.	Unic. Falcate	H x 5
3.	Bic. Conical	H x 5
4.	Unis. Filiform	H x 5
5.	Unis. Hooked	H x 5
6.	Unis. Conical	L x 10
7.	Peltate	H x 10
8.	Unic. Gld. Cap.	H x 10
9.	Unis. Gld. M-celled. Cap.	H x 10
10.	Unis. Neck-celled. Gld. Cap.	H x 5



# PLATE-16



**6. Unis. Conical :** (Code K)

Foot: compound, elevated. Body: 6-10 celled long; cells unequal; basal cell bulbous; terminal cell lanceolate, tip acute; cross walls thick, distinct; content dense, yellow. (Fig. 6)

**Distb. :** Stem , Tendril, Leaves, Sepals and Ovary.

**7. Peltate :** (Code O )

Foot: Not visible. Body: many – celled, plate- like, 1-celled thick, parallel to epidermis; cells variable, arranged around central cell in many whorls; outer wall irregular, vesiculate; content granulated, yellow (Fig. 7)

**Distb. :** Stem and Ovary.

**8. Unic. Gld. Capitate :** (Code P )

Foot: Simple. Body: very small , differentiated; stalk 1-celled, hyaline; head spherical, inflated; outer wall thin, irregular and vesiculated; content granulated yellow (Fig. 8)

**Distb. :** Tendril, Leaves, Pedicel, Sepals, Petals, Ovary and Stamens.

**9. Unis. Gld. M-celled capitate :** (Code X )

Foot: Simple. Body: Differentiated; stalk 3-celled, small, erect; cells rectangular; head multi cellular, globose; outer wall thin, vesiculated; content granulated yellow. (Fig. 9)

**Distb. :** Stem , Petiole, Leaves, Pedicel, Sepals and Ovary.

**10. Unis. Neck-celled Gld. Capitata : (Code Y)**

Foot: Simple, elevated. Body : long , differentiated ; stalk 3-4 celled, cells long, cylindrical ; terminal cell bi-concave like neck, weak; head multi cellular , spherical; cells arranged in regular manner; outer wall thin , vesiculated; content granulated yellow. (Fig. 10)

**Distb. :** Stem , Petiole, Leaves and Sepals.

*OTU - 17. Luffa cylindrica, (L.) m. Roem.*

This taxa shows ten types of trichome (Plate 17, Fig- 1-10)

**1. Unic. Falcate: (Code A V)**

**Foot:** Simple . Body: 1-celled , erect, entire, falcate- shaped; wall thick, smooth; lumen narrow, content dense granulated. (Fig. 1)

**Distb. :** Tendril, Sepal , Petal and Ovary.

**2. Unic. Flagellate : (Code A VI)**

**Foot:** Simple. Body : 1-celled , hyaline, elongated; wall torulated; variously shaped; content translucent. (Fig. 2)

**Distb. :** Petals, Stamen and Ovary.

**3. Uniseriate Filiform : (Code G)**

**Foot:** Simple. Body: 4-7 celled, filiform; cells barrel shaped; joint distinct; tip rounded ; lateral and cross walls thick; content opaque . (Fig. 3)

**Distb. :** Stem, Petiole, Leaves and Sepals.

**4. Unis. Cyindrical: (Code H)**

**Foot:** Compound , emarginate. Body: many celled , uniseriate cylindrical; cells discoid with irregular outline; tip rounded; content opaque. (Fig. 4)

**Distb. :** Tendril, Pedicel, Petals and Ovary.

**5. Unis. Hooked: (Code I)**

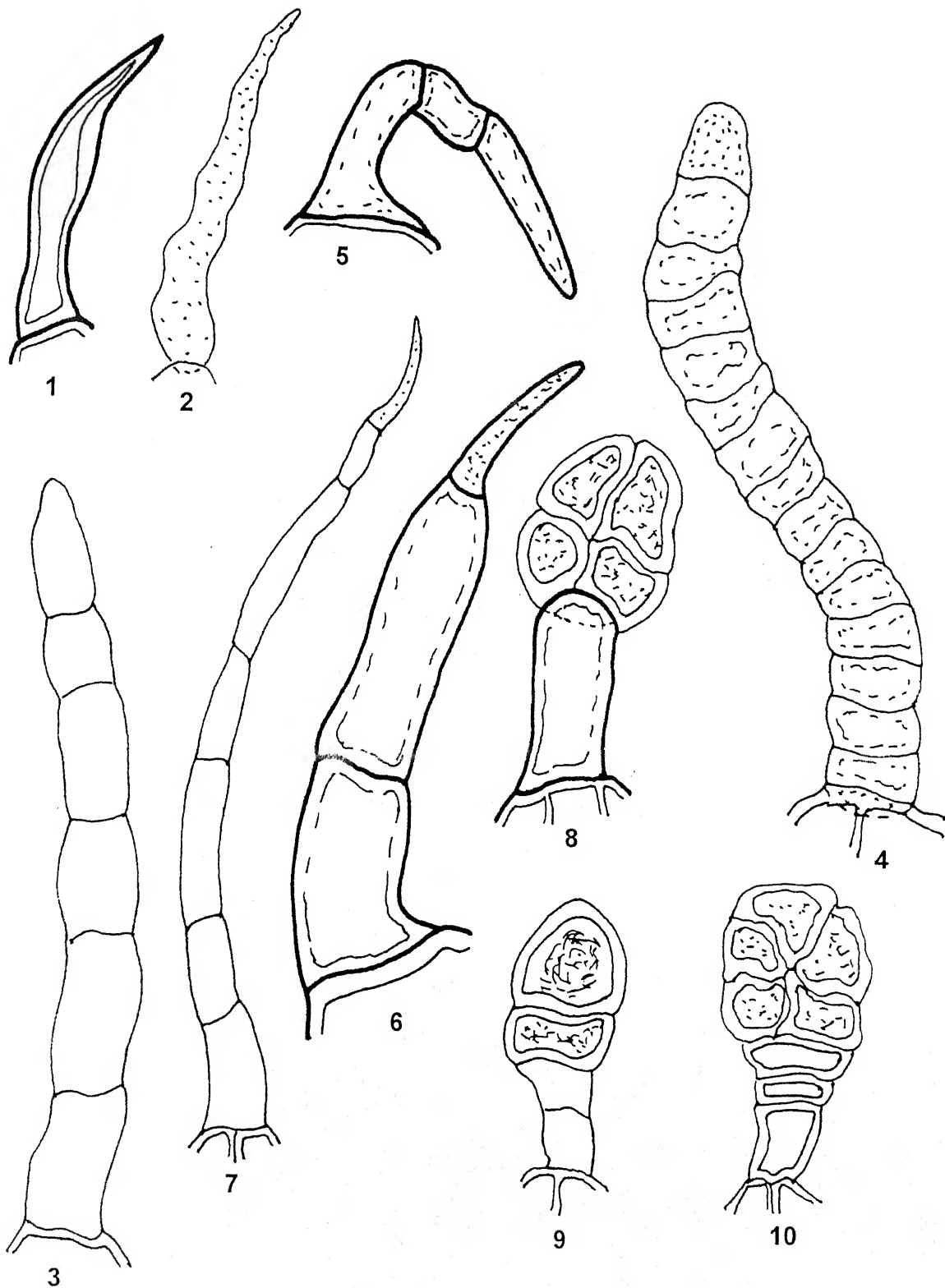
**Foot:** Simple, broad . Body: 3-celled, basal cell erect with bulbous base, middle and terminal cell bent to a hooked; tip acute; lateral and cross walls thick; content dense yellow (Fig. 5).

**Distb. :** Stem, Petiole and Pedicel.

## EXPLANATION OF PLATE- 17

Fig. No.	Trichome Type	Mgn.
1.	Unic. Falcute	H x 10
2.	Unic. Flagellate	H x 10
3.	Unis. Filiform	H x 5
4.	Unis. Cylindrical	H x 5
5.	Unis. Hooked	H x 5
6.	Unis. Conical	H x 10
7.	Unis. Sept. Flagellate	L x 10
8.	Unic. Gld. 4-celled. Cap.	H x 10
9.	Bic. Gld. 2-celled. Cap.	H x 10
10.	Unis. Gld. M-celled. Cap.	H x 10

# PLATE-17





**6. Unis. Conical : (Code K)**

**Foot:** Simple , broad. : Body: 3-4 celled , differentiated; all cells oblong, barrel shaped except terminal one; terminal cell narrow, acuminate; lateral and cross walls thick; lumen wide; content dense granulated. (Fig. 6)

**Distb. :** Stem, Tendril, Petiole, Leaves, Pedicel and Sepal.

**7. Unis. Septate Flagellate: (Code L)**

**Foot:** Compound. Body: many celled, narrow, flagellated; cells unequal in length; tip hyaline; walls thin; content translucent. (Fig. 7)

**Distb. :** Stem, Tendril, Leaves, Petals and ovary.

**8. Unicellular Glandular 4-Celled Capitate: (Code R)**

**Foot:** Compound. Body : Differentiated; stalk 1-celled, erect, cylindrical; head 4- celled, rounded; outer walls thin; content dense, granulated yellow. (Fig. 8)

**Distb. :** Stem, Leaves, Sepals and Ovary.

**9. Bic. Gld. 2-Celled Capitate : (Code S)**

**Foot:** Compound. Body : simple, glandular, stalk 2- celled, very small , hyaline; head 2-celled, uppercell tomb- shaped; walls thin, irregular; content dense, granulated yellow. (Fig. 9)

**Distb. :** Leaves, Sepals and Petals.

**10. Unis. Gld. M-celled Capitate: (Code X)**

**Foot:** Compound . Body : Differentiated; stalk 3- celled small; basal cell longest; wall thin ; head many – celled, globose, irregular; lumen filled with dense, granulated golden yellow contents. (Fig. 10)

**Distb. :** Petiole, Leaves, Pedicel, Sepals and Ovary.

OTU-18 *Melothria maderaspatana*, Congn.in DC.

1. **Unic. Conical** : (Code AII)

**Foot:** Simple. Body: 2- types; I. one-celled, dwarf, proximal part bulbous, distal part sharply pointed; content dense granulated, yellow (Fig. 1A) or II. one-celled, elongated to a pointed tip; wall thick; content yellow. (Fig. 1B)

**Distb.** : (Fig. 1A) Stem, Tendril, Leaves, Sepals and ovary; (Fig. 1B) Stem, Petiole, Leaves, Pedicel and Sepals.

2. **Unic. Arrect:** (Code A III)

**Foot:** Compound, broad. Body: 1-celled, basilatus, angular- arrect; wall thick; lumen narrow, content granulated yellow. (Fig. 2)

**Distb.** : Stem, Leaves, Pedicel and sepals.

3. **Unic. Flagellate:** (Code A VI)

**Foot:** Simple. Body: one-celled, long, irregular, hyaline ; wall thin; content granulated translucent . (Fig. 3)

**Distb.** : Petals, Stemens, Ovary and Stigma.

4. **Bic. Conical** : (Code D)

**Foot:** Simple, convex. Body: 2- celled, dwarf, errect; tip pointed; wall thick; lumen narrow, content dense, granulated, golden yellow. (Fig. 4)

**Distb.** : Stem, Tendril, Leaves, Pedicel and Sepals.

5. **Unis. Hooked** : (Code I)

**Foot:** Compound, emarginated. Body : 3- celled, hooked; basal cell basilatus; apical cell rigid, conical; outer wall irregular, thick, cross wall thick; content dense. (Fig. 5)

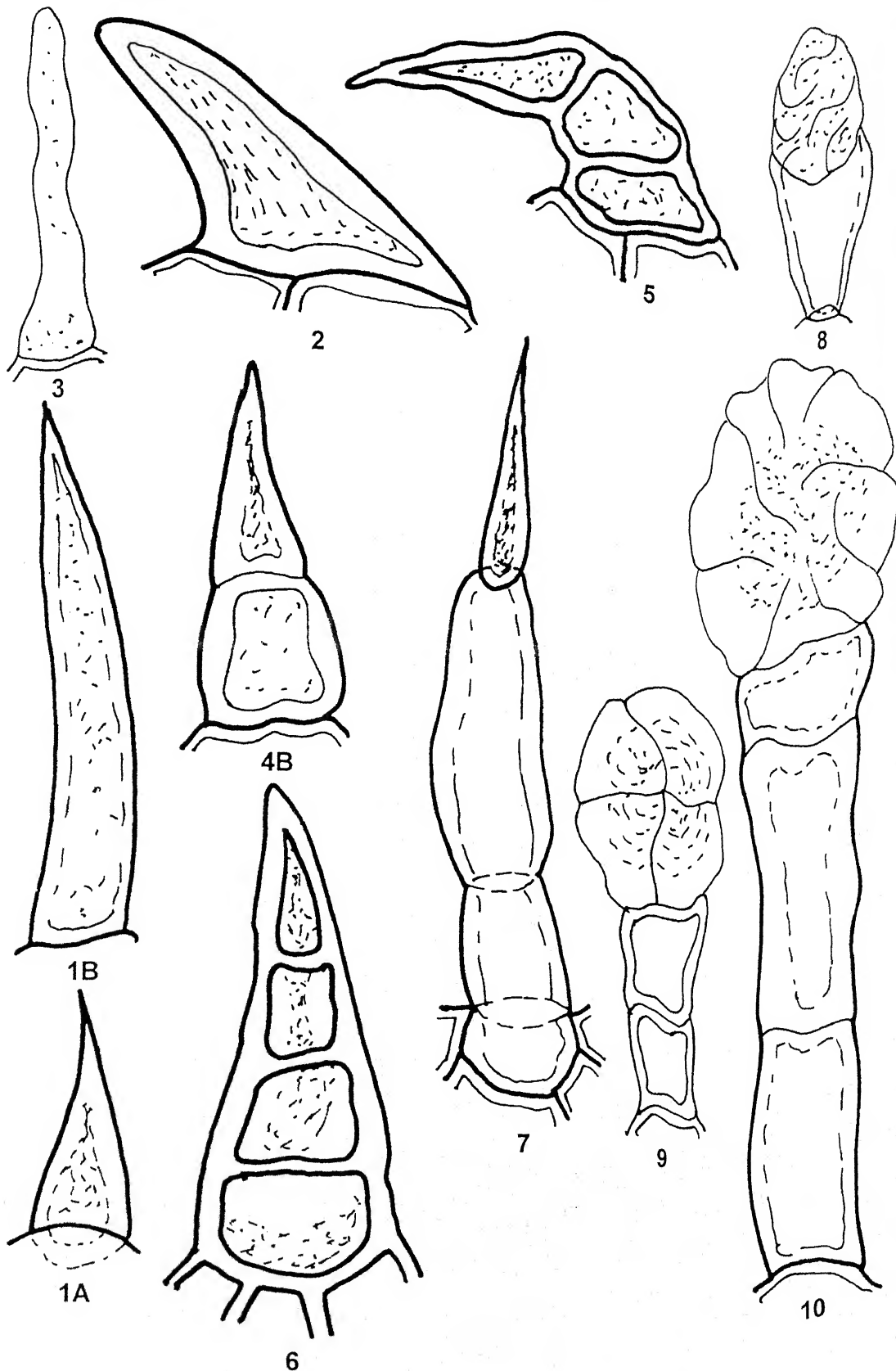
**Distb.** : Stem , Leaves and Ovary.



# EXPLANATION OF PLATE- 18

Fig. No.	Trichome Type	Mgn.
1.	Unic. Conical	H x 10
2.	Unic. Arrect	H x 10
3.	Unic. Flagellate	H x 10
4.	Bic. Conical	H x 10
5.	Unis. Hooked	H x 10
6.	Unis. Conical	H x 5
7.	Unis. Belemoid	H x 5
8.	Unic. Gld. Cap.	H x 10
9.	Bic. Gld. 4-celled. Cap.	H x 10
10.	Unis. Gld. M-celled. Cap.	H x 5

# PLATE-18



**6. Unis. Conical : (Code K)**

**Foot:** Compound. **Body:** thick, stiff, erect and 4-celled conical; lateral and cross walls thick; tip pointed; content dense yellow. (Fig. 6)

**Distb. :** Petiole , Pedicel and Sepals.

**7. Unis. Belemnoid: (Code M)**

**Foot:** Compound. **Body:** Differentiated; except terminal one, all cells cylindrical , unequal, irregular; apical cell acuminate, narrow; lateral and cross wall thick content golden yellow . (Fig. 7)

**Distb. :** Stem, and Pedicel.

**8. Unic. Gld. Capitate : (Code P)**

**Foot:** Simple. **Body:** Differentiated ; stalk 1- celled, hyaline, obovate; head 1-celled, rounded; wall very thick vesiculated, irregular; content granulated yellow (Fig. 8)

**9. Bic. Gld. 4-celled Capitate : (Code T)**

**Foot:** Simple. **Body:** Differentiated; stalk 2- celled, erect; cells longer than broad; wall thick head 4- celled, dolliform; outer wall thin; content granulated. (Fig. 9)

**Distb. :** Stem, Tendril, Leaves, Petals and Ovary.

**10. Unis. Gld. M-Celled Capitate : (Code X)**

**Foot:** Simple. **Body:** Differentiated; stalk 3- celled erect; upper cell discoid, walls thick, content yellow; head multi cellular, globose; outer wall thick hyaline, vesiculated, irregular; content dense, granulated. (Fig. 10)

**Distb. :** Stem, Leaves, Petals and Ovary.

OTU-19, *Momordica charantia* L.

This taxa shows ten types of trichome ( plate 19,fig 1-10)

**1.Unicellular Papillose:** (Code A1)

Foot: Simple. Body: 1- celled, long, irregular, inflated; wall thin; content translucent,, tip granulated. (Fig.1)

**Distb :** Petals, Stamens and Stigma .

**2. Unic. Conical :** (Code A II)

Foot: Simple Body: 1-Celled, entire, erect, conical, distal part sharply pointed; wall thick; lumens narrow; content dense . (Fig.2)

**Distb. :** Stem, Petiole, Leaves, Tendril and Sepal.

**3.Uniseriate Filiform :** (Code G)

Foot: compound. Body: 3-5 celled, entire; basal cell broader than length; tip rounded; ;lateral and cross walls thin; lumen narrow, content translucent. (Fig. 3)

**Distb. :** Stem, Tendril , Pedicel and Sepals.

**4. Unis. Cylindrical :** (Code . H)

Foot: compound, emarginate. Body: many celled, flexible; cell discoid; wall thin, content translucent; terminal cell domed with dense, granulated content. (Fig. 4)

**Distb. :** Petals .

**5. Unis. Hooked :** (Code I)

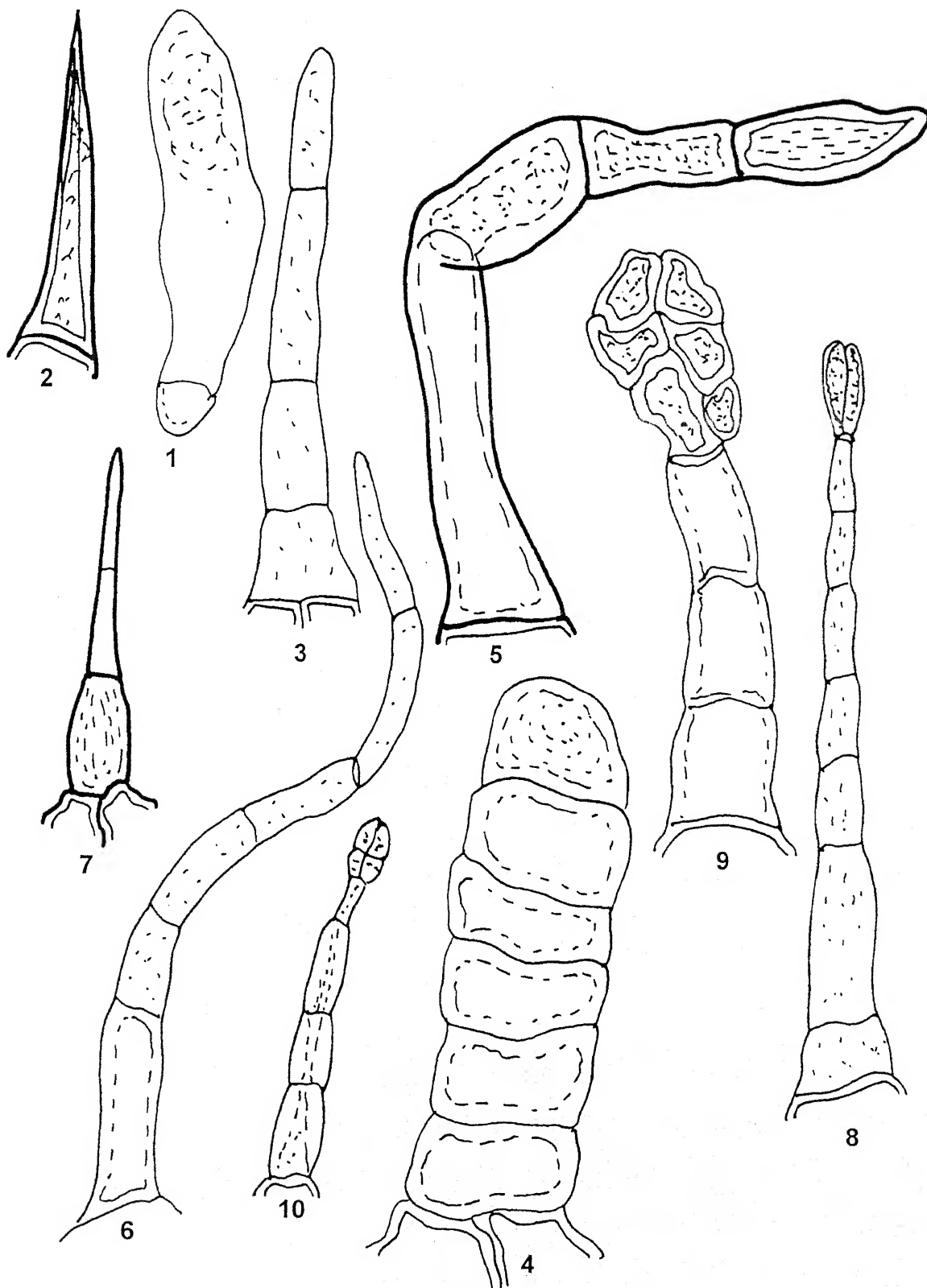
Foot: Simple. Body: 4- celled, hooked; basal cell longest, erect; next cell bent at joint; terminal cell oblong, tip obtuse; wall thick; lumen narrow; content dense yellow. (Fig.5)

**Distb.:** Stem, Petiole and Pedicel.

# EXPLANATION OF PLATE- 19

Fig. No.	Trichome Type	Mgn.
1.	Unic. Papillose	L x 10
2.	Unic. Conical	L x 10
3.	Unis. Filiform	L x 10
4.	Unis. Cylindrical	H x 10
5.	Unis. Hooked	L x 10
6.	Unis. Sept. Flagellate	H x 5
7.	Unis. Belemnoid	H x 5
8.	Unis. Gld. 2-celled. Cap.	L x 10
9.	Unis. Gld. 4-celled. Cap.	L x 10
10.	Unis. Neck-celled. Gld. Cap.	L x 10

# PLATE-19



**6. Unis. Septate Flagellate: (Code L)**

Foot: Simple. Body : many celled, very long; flexible; basal cell longest; terminal cell hyaline; lateral and cross wall thin; content opaque . (Fig. 6)

**Distb. :** Tendril, Pedicel, Sepals, Petals and Ovary .

**7. Unis. Belemnoid: (Code M)**

Foot: compound. Body : 3- celled , erect, dart-shaped , basal cell large, barrel-shaped; rest two cells sharply acuminate with pointed tip; content dense yellow. (Fig. 7)

**Distb. :** Stem, Leaves, Sepal

**8. Unis. Gld. 2- Celled Capilate : (Code V)**

Foot: Simple. Body: Differentiated; stalk 4-7 celled, erect, narrowing gradually; basal cell broader than length; head 2- celled, doliform; content dense , granulated, yellow. (Fig. 8)

**Distb. :** Stem, Petiole, Leaves and Sepals

**9- Unis. Gld. 4- Celled capilate: (Code W)**

Foot: Simple. Body : differentiated; stalk 3-celled, cylindrical, cross walls distinct; head 4-celled, irregularly globose; outer wall thin; content dense golden yellow. (Fig. 9)

**Distb. :** Leaves & Petals

**10. Unis. Neck-celled Gld. Capilate: (Code Y)**

Foot: Simple. Body: Very small, differentiated; stalk 4- celled, filiform, distal cell biconcave like a neck; head 4-celled, oblong; content yellow granulated. (Fig. 10)

**Distb. :** Petals and Ovary



OTU 20. *Momordica dioica*, Roxb. Ex. Willd

This taxa shows nine types of trichome (Plate 20.Fig. 1-9)

1. **Unic. Papillose:** (Code AI)

**Foot:** Simple . **Body:** 1-celled, elongated, variable shape, papillose; wall thin, hyaline; content translucent. (Fig. 1)

**Distb. :** Petals.

2. **Unic. Arrect :** (Code A III)

**Foot:** Compound . **Body:** 1- celled, broad, obliquely erect; tip pointed; wall thick; content dense granulated. (Fig. 2)

**Distb. :** Stem, Petiole, Leaves, Sepals and Ovary.

3. **Bic. Belemnoid:** (Code F)

**Foot:** Compound. **Body :** 2- celled, dwarf ; basal cell barrel shaped; upper cell stiff, acerate, tip pointed; wall thick; content dense, yellow. (Fig. 3)

**Distb. :** Stem, Tendril , Petiole, Pedicel and Ovary.

4. **Unis. Filiform:** (Code G)

**Foot:** Compound, emarginate. **Body:** 5-7 celled , long, filiform; cell oblong; tip rounded; lateral and cross walls thin ; lumen normal; content granulated. (Fig. 4)

**Distb. :** Stem, Pedicel and Sepals.

5. **Unis. Cylindrical:** (Code H)

**Foot:** Simple **Body :** many celled , flexible, irregular; cells discoid or rectangular; terminal cell inflated; walls hyaline, thin; content granulated; translucent. (Fig. 5)

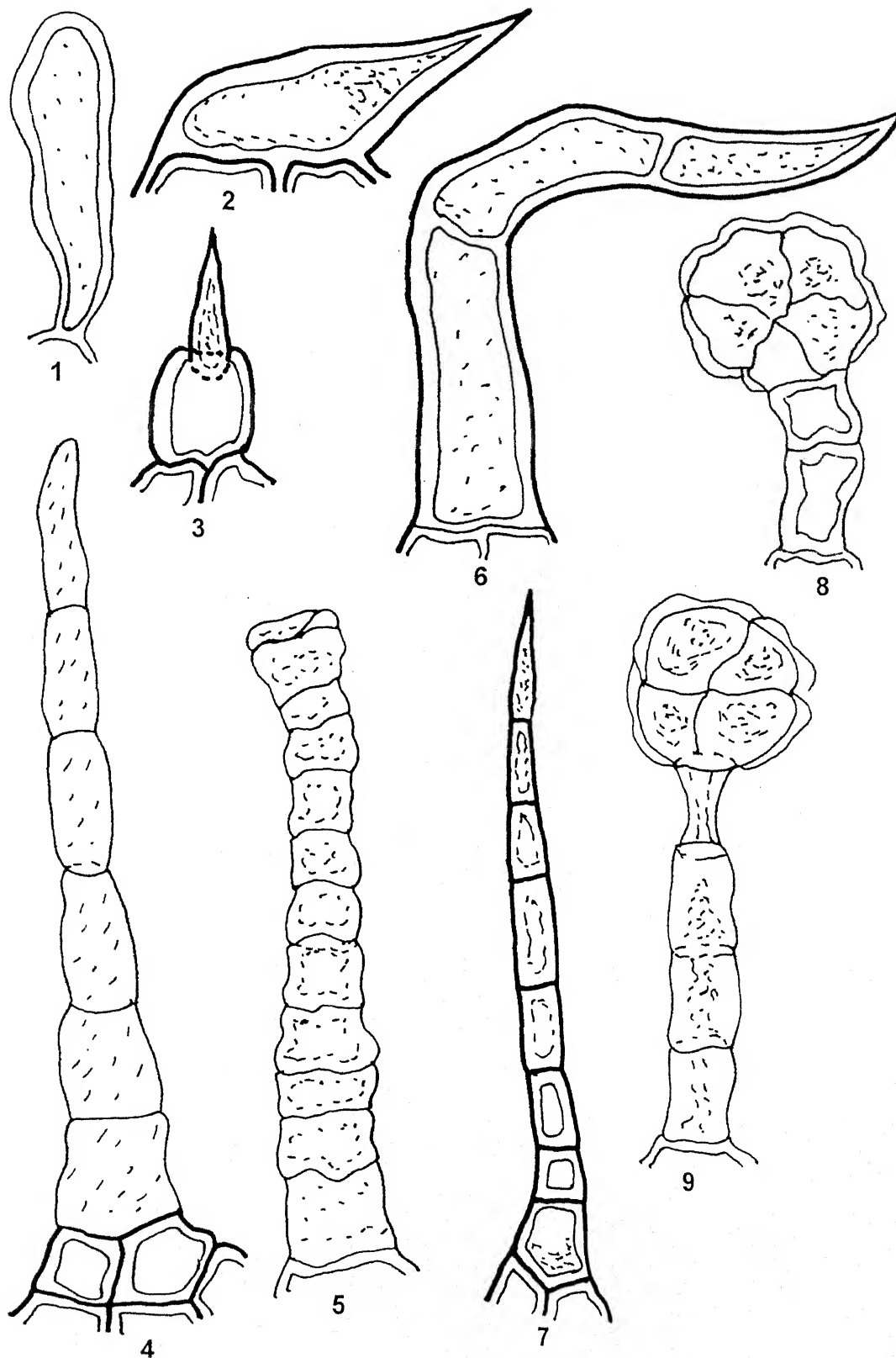
**Distb. :** Petals.



## EXPLANATION OF PLATE- 20

Fig. No.	Trichome Type	Mgn.
1.	Unic. Papillose	H x 10
2.	Unic. Arrect	H x 10
3.	Bic. Belemonid	H x 10
4.	Unis. Filiform	H x 5
5.	Unis. Cylindrical	H x 5
6.	Unis. Hooked	H x 5
7.	Unis. Conical	H x 7
8.	Bic. Gld. 4-celled Cap.	H x 10
9.	Unis. Neck-celled. Gld.Cap.	H x 10

# PLATE-20



**6. Unis. Hooked : (Code I)**

**Foot:** Compound . Body : 3-celled , hooked; basal cell long, erect; middle cell curved; terminal cell conical, straight ; lateral and cross wall thick; lumen wide; content dense yellow. (Fig. 6)

**Distb. :** Stem, Petiole, Leaves, Sepals and Ovary.

**7. Unis. Conical : (Fig. K)**

**Foot:** Compound. Body: 6-9 celled , stiff, erect; cells of variable length ; terminal cell narrow, acuminate; walls thick; lumen narrow, content dense, yellow. (Fig. 7)

**Distb. :** Stem , Sepals and ovary.

**8. Bic. Gld. M-Celled Capitate: (Code U)**

**Foot:** Simple. Body: Differentiated; stalk 2- celled, very short; lumen narrow; content dense; head multicellular, globose; cells irregularly inflated; outer walls vesiculated; content yellow. (Fig.8)

**Distb. :** Stem, Tendril, Leaves, Pedicel and Ovary.

**9. Unis. Neck- celled Gld. Capitate: (Code. Y)**

**Foot:** Simple. Body: Differentiated; stalk 4-5 celled, uniseriate; terminal cell narrow like neck; head 4- celled, dolliform, rounded; outer wall vesiculated, hyaline; content granulated golden yellow. (Fig. 9)

**Distb. :** Leves, Sepals and Petals.

**OTU – 21 *Momordica balsamina* , wall (nonL. )**

This taxa shows fourteen types of trichome (Plate 21, Fig. 1-14)

**1. Unic. Papillose : (Code A 1)**

Foot: Simple. Body: 1-celled, very small, papillose; wall thin; content translucent. (Fig. 1)

**Distb. :** Tendril , Petiole, Leaf , Petals, Stamen and Stigma.

**2. Unic. Conical : (Code A II )**

Foot: compound . Body: 1-celled, stiff – erect; tip acute; lateral wall thin ; lumen narrow; content dense yellow. (Fig. 2 )

**Distb. :** Stem, Pedicel and ovary.

**3. Unic. Arrect : (Code A III )**

Foot: Simple. Body: Arrect, basal part bulbous; distal acuminate, tip acute; wall thick; content opaque. (Fig. 3)

**Distb. :** Stem, Petiole, Leaf, Pedicel.

**4. Bic Cylindrical : (Code C )**

Foot: Simple. Body : very small, hyaline, 2-celled, cylindrical ; tip rounded ; wall thin; content translucent. (Fig. 4)

**Distb. :** Petals, Stamen and Stigma.

**5. Bic. Belemnoid : (Code F )**

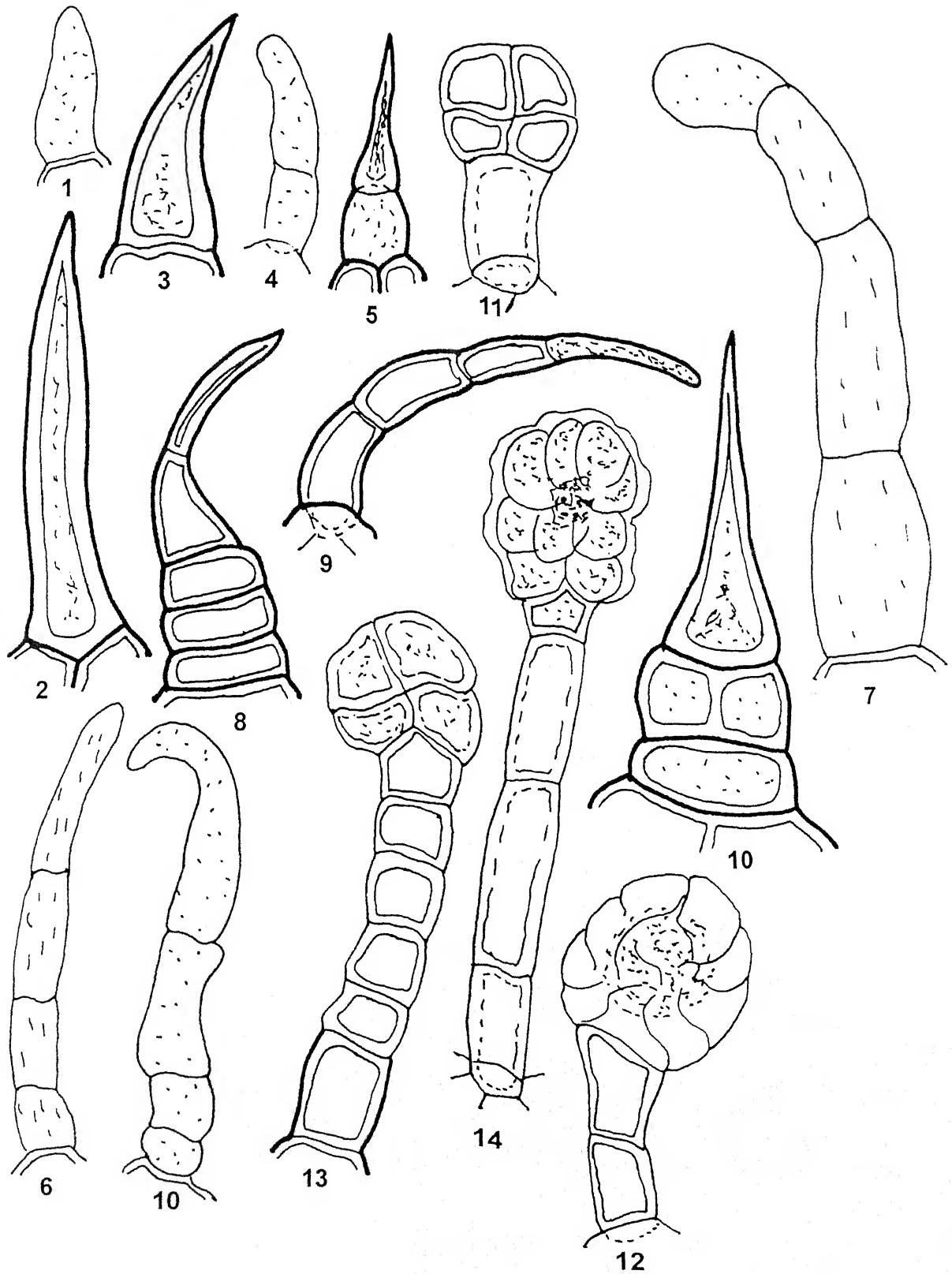
Foot: compound. Body: 2-celled, differentiated; basal cell bulbous, oblong; upper cell acuminate with sharp pointed end; lumen narrow; content dense yellow.(Fig.5 )

**Distb. :** Leaf, Pedicel and Sepals.

# EXPLANATION OF PLATE- 21

Fig. No.	Trichome Type	Mgn.
1.	Unic. Papillose	H x 10
2.	Unic. Conical	H x 10
3.	Unic. Arrect	H x 10
4.	Bic. Cylindrical	H x 10
5.	Bic. Belemnoid	H x 10
6.	Unis. Filiform	H x 5
7.	Unis. Cylindrical	H x 5
8.	Unic. Belemnoid	H x 10
9.	Unis. Curved	H x 10
10.	Unis. Conical	H x 5
11.	Unic. Gld. 4-celled Cap.	H x 10
12.	Bic. Gld. m-celled. Cap.	H x 10
13.	Unis. Gld. 4-celled Cap.	H x 5
14.	Unis. Gld. M-celled Cap.	H x 5

# PLATE-21



**6. Uniseriate Filiform : (Code G )**

Foot: Simple. Body: entire, 3-5 celled filiform; terminal cell longest; lateral & cross wall thin , rugose; content translucent. (Fig. 6 )

**Distb. :** Stem, Tendril, Petiole, Leaf, Pedicel.

**7. Unis. Cylindrical : (Code H )**

Foot: Simple. Body : 3-5 celled, cylindrical; wall thin, flexible; lumen wide, content translucent. (Fig. 7 )

**Distb. :** Leaf, Sepals, Petals and Ovary.

**8. Unis. Hooked : (Code I )**

Foot: Simple. Body: Differentiated ; proximal cells much broader than length making bulbous base; distal cells sharply curved making hooked structure ; lateral and cross walls thick; lumen narrow; content granulated yellow. (Fig. 8)

**Distb. :** Stem, Petiole, Leaf.

**9. Unis. Curved : (Code J )**

Foot: compound. Body: 4-6 celled, curved; cells longer than breadth; lumen normal, content translucent. (Fig. 9)

**Distb. :** Leaf, Pedicel and Sepals.

**10. Unis. Septate flagellate : (Code L )**

Foot: Simple. Body: Differentiated, 3-5 celled, flagellated; lower cells much smaller than upper one; terminal cell longest; wall thin ; content translucent, granulated. (Fig. 10)

**Distb. :** Tendril , Sepals, Petals, Ovary and Stigma .



**11. Unic.Gld. 4-celled Capitata : (Code R )**

Foot: Simple. Body: Differentiated; stalk 1-celled, columnar; head rounded ,4-celled; content dense, yellow. (Fig. 11 )

**Distb. :** Tendril, Petals, Stamen, Ovary and Stigma.

**12. Bic. Gld. M-celled Capitata : (Code. U)**

Foot: Simple . Body: Differentiated; stalk 2-celled, narrow; head multi celled, large , globose; walls thin, inflated; content granulated translucent. (Fig. 12)

**Distb. :** Pedicel, Sepal, Petals and Ovary .

**13. Unis.Gld. 4-celled Capitata : (Code W )**

Foot: Simple . body : Differentiated; Stalk 3-6 celled, cells isodiametrical; head 4-celled, rounded; content dense and granulated (Fig. 13)

**Distb. :** Stem, Leaf and Pedicel.

**14. Unis.Gld. M-celled Capitata : (Code X )**

Foot: Simple . Body: differentiated, stalk 3-4 celled; cells very long except the upper one; head oblong, multi cellular; cells rounded, thin walled, content granulated translucent. (Fig. 14)

**Distb. :** Pedicel, Sepals, Setals and Ovary.



OTU-22 *Trichosanthes dioica*, Roxb

This taxa shows eleven types of trichomes (Plate 22, figs. 1-11)

1. Unic. Conical : (Code A II)

Foot: Shunked. Body 1-celled, dwarf, conical; basal region shunked into epidermis, broad and oblong; distal region sharply narrowing to a acute tip; wall thick; content dense. (Fig. 1)

Distb. : Stem, Tendril and Leaves.

2. Unic. Curved : (Code A IV)

Foot: Simple. Body : 1-celled, stiff, curved; tip pointed; wall thick; lumen narrow; content granulated opaque. (Fig. 2)

Distb. : Petiole, Leaves and Ovary.

3. Unic. Flagellate : (Code A VI)

Foot: Not visible. Body: 1-celled, very long, narrow, irregular; tip rounded; walls thin, undulating; lumen wide; content translucent. (Fig. 3)

Distb. : Tendril, Sepals, Petals and Ovary.

4. Bic. Cylindrical : (Code C)

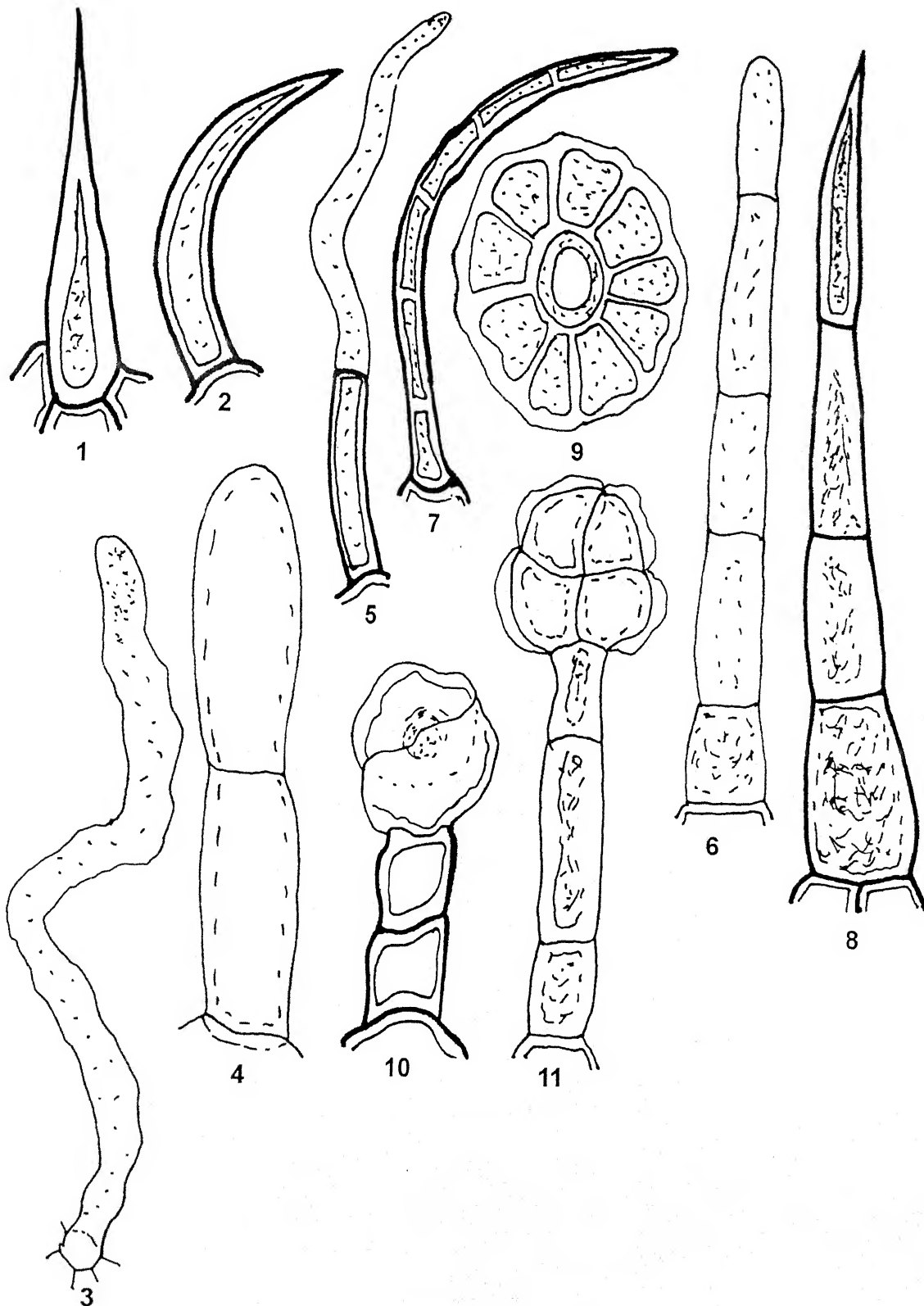
Foot: Simple. Body: 2- celled, dwarf, cylindrical; cells of equal size, barrel-shaped; tip rounded; lateral and cross walls thin; lumen wide; content translucent. (Fig. 4)

Distb. : Tendril, Sepals, Petals and Ovary.

# EXPLANATION OF PLATE- 22

Fig. No.	Trichome Type	Mgn.
1.	Unic. Conical	H x 10
2.	Unic. Curved	H x 10
3.	Unic. Flagellate	H x 5
4.	Bic. Cylindrical	H x 5
5.	Bic. Asept. Flagellate	H x 5
6.	Unis. Filiform	H x 5
7.	Unis. Curved	H x 5
8.	Unis. Conical	L x 10
9.	Peltate	H x 10
10.	Bic. Gld. 2-celled. Cap.	H x 10
11.	Unis. Gld. 4-celled. Cap.	H x 5

# PLATE-22



### 5. Bic. Asept. Flagellate: (Code E )

Foot: Simple. Body : 2-celled, differentiated; basal cell long, columnar, erect, lumen narrow, content granulated; upper cell very long, irregularly flexible, hyaline, wall thin, content translucent. (Fig. 5)

**Distb. :** Stem, Petiole, Pedicel, Sepals and Petals.

### 6. Unis. Filiform : (Code G )

Foot: Simple. Body: 5-6 celled, entire, filiform; cells longer than broad; tip rounded; lateral and cross walls thin, smooth; lumen wide, content translucent. (Fig. 6)

**Distb. :** Stem, Petiole and Pedicel .

### 7. Unis. Curved : (Code J)

Foot: Simple. Body: 5-6 celled, curved; cells columnar, long; terminal cell conical; lateral and cross walls thick; lumen narrow; content granulated opaque. (Fig. 7)

**Distb. :** Stem, Petiole and Leaves.

### 8. Unis. Conical : (Code K )

Foot: Compound . Body: 4-celled, conical; basal cell barrel shaped, base bulbous; cells of various length; terminal cell conical , tip acute; wall thick; content granulated opaque. (Fig. 8)

**Disbt.:** Stem , Petiole and Leaves.

### 9. Peltate. : (Code O )

Foot: Simple. Body: multicellular, flattened, 1-celled thick, spherical, parallel to epidermis; cells rectangular, arranged in a ring around central circular region;

outer wall thick, smooth, lateral walls thick, content dense , granulated, yellow.  
(Fig. 9)

**Distb.** : Stem, Leaves, Sepals and Ovary.

**10. Bic. Gld. 2-celled Capitate. : (Code S )**

Foot: Simple, emarginate. Body: Differentiated; stalk 2-celled, stiff, erect, cells rectangular, walls thick, smooth; head 2-celled, spherical; cells large, domed; outer wall thin, undulated; content granulated yellow. (Fig. 10)

**Distb.** : Leaves, Sepals and Petals.

**11. Unis. Gld. 4-Celled Capitate : (Code W )**

Foot: Simple. Body : Differentiated ; stalk 3-celled, erect; middle cell longest, basal and terminal cell equal size; lateral and cross wall thin; lumen narrow, content dense; head 4-celled, dolliform; arrangement regular, outer wall thin, vesiculated. (Fig. 11)

**Distb.** : Stem, Petiole, Leaves and Pedicel.

OTU-23, *Trichosanthes anguina*, Linn.

This taxa shows eleven types of trichome (Plate- 23, Fig. 1-11)

**1. Unic. Papillose : (Code AI)**

Foot: Not visible. Body: 1-celled, hyaline, oblong, dwarf wall thin, smooth; body various; content translucent. (Fig. 1)

**Distb. :** Sepals, Petals and Ovary.

**2. Unic. Conical : (Code AII)**

Foot: Simple. Body : 1-celled, stiff, dentate – conical, dwarf acuminate, base bulbous, distal and tapering, acute; tip pointed; wall thick; lumen narrow; content granulated, yellow. (Fig. 2)

**Distb. :** Stem, Tendril, Leaves, Pedicel and Sepals.

**3. Bic. Filiform : (Code B)**

Foot: Simple. Body: 2- celled, filiform; cells very long, and narrow; joint distinct; wall thin; lumen wide; content translucent. (Fig. 3)

**Distb. :** Stem, Tendril, Leaves and Ovary.

**4. Bic. Conical : (Code D)**

Foot: Simple, elevated. Body: 2- celled, stiff, erect; basal cell berrel – shaped, oblong; upper cell much longer than basal, gradually tapering to a acute tip; lateral and cross walls thick; lumen wide; content dense , yellow. (Fig. 4)

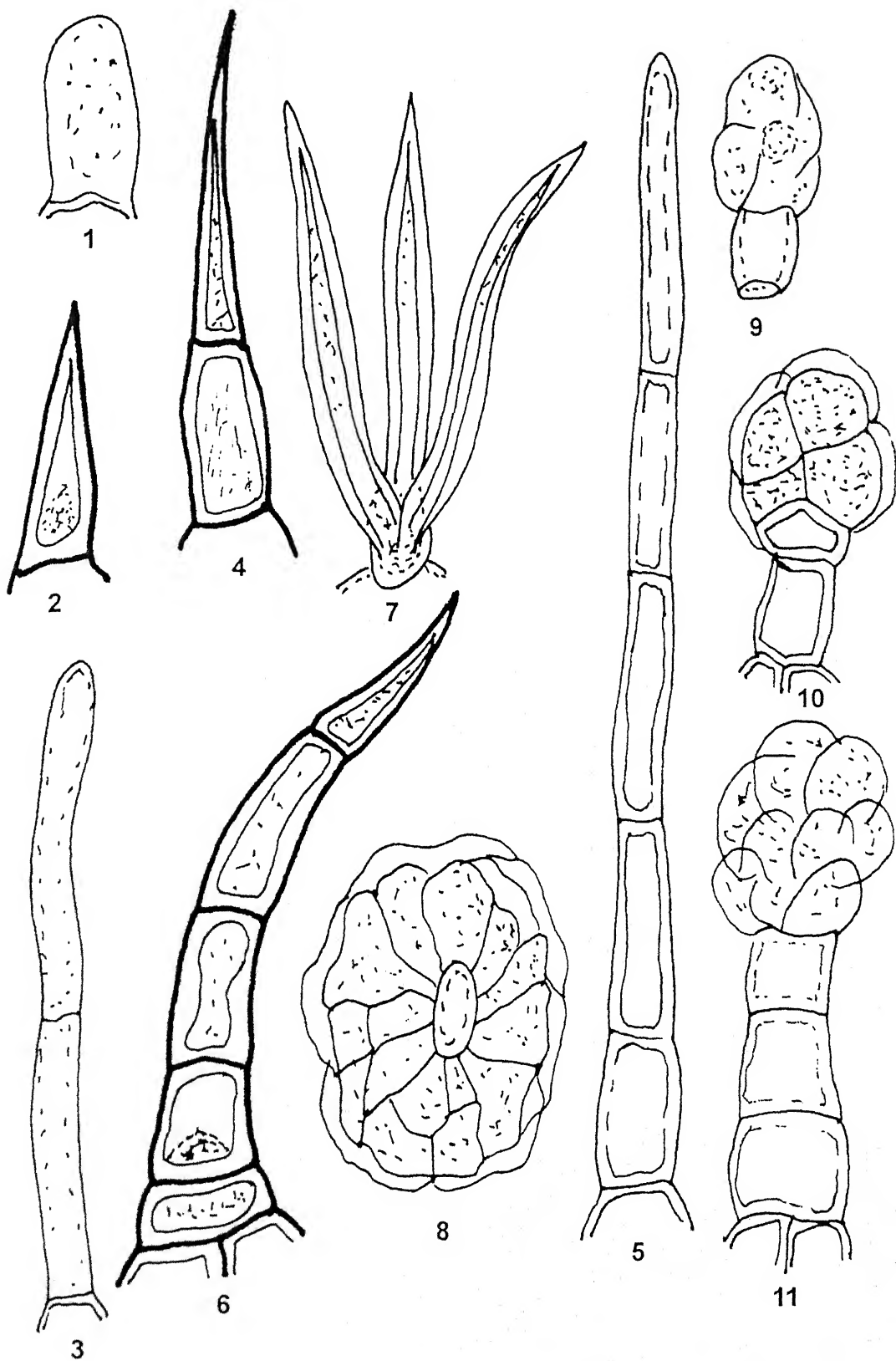
**Distb. :** Stem, Petiole, Leaves and Pedicel.

## EXPLANATION OF PLATE- 23

Fig. No.	Trichome Type	Mgn.
1.	Unic. Papillose	H x 10
2.	Unic. Conical	H x 10
3.	Bic. Filiform	H x 10
4.	Bic. Conical	H x 10
5.	Unis. Filiform	L x 10
6.	Unis. Curved	H x 5
7.	Stellate	H x 10
8.	Peltate	H x 10
9.	Unic. Gld. Cap.	H x 10
10.	Bic. Gld. 4-celled. Cap.	H x 10
11.	Unis. Gld. M-celled. Cap.	H x 10



# PLATE-23





### 5. Unis. Filiform : (Code G)

Foot: Simple. Body: 4-7 celled, long, columnar, filiform; cells of various length, basal cell shortest; tip rounded; lateral and cross walls thick; lumen narrow; content granulated translucent. (Fig. 5)

**Distb.** : Stem, Petiole, Leaves and Pedicel.

### 6. Unis. Curved : (Code J)

Foot: compound, emarginate. Body: 5-6 celled, gradually curved to a conical end, entire; cells varied, basal cell short, discoid; terminal cell conical; tip pointed; joints distinct; walls thick; lumen wide; content granulated yellow (Fig. 6)

**Distb.** : Stem , Petiole, leaves and Sepals.

### 7. Stellate : (Code N)

Foot: compound, elevated. Body: Tri - radiate, differentiated; stalk 1-celled, small ; rays unicellular, very long, lanceolate, stiff; tip acute; walls thick, smooth; lumen narrow; content dense, opaque. (Fig. 7)

**Distb.:** Stem, Petiole and Pedicel.

### 8. Peltate : (Code O )

Foot: Not visible. Body: multicellular, rosetted - peltate; 1-celled thick, parallel to epidermis; cells of various shape, arranged around a rounded center; outer wall thin irregular and vesiculated ; contents granular golden yellow. (Fig. 8)

**Distb.** : Stem, Pedicel and Ovary.

### 9. Unic. Gld. Capitate : (Code P )

Foot: Not visible. Body: dwarf, defferentiated ; stalk 1-celled, cell small, barrel shaped; wall thin; content transluscent; head 1-celled, small, oblong; outer wall thin, inflated- vesiculate giving papillose appearance; content granulated opaque. (Fig. 9)

**Distb. :** Tendril, Sepals, Petals, Stamens and Stigma.

### 10. Bic. Gld. 4- Celled Capitate : (Code T)

Foot: compound. Body: Differentiated; stalk 2-celled, lower cell oblong, large; upper cell rectangular, small, walls thick, lumen narrow, content granulated; head 4-celled, globular, entire; wall thick, smooth; content dense, granulated, golden yellow.(Fig.10)

**Distb. :** Stem, Petiole, Leaves and Sepals.

### 11. Unis. Gld. M-celled Capitate : (Code X)

Foot: compound. Body: Differentiated; stalk 3-celled, dwarf, errect; cells rectangular; base bulbous; lateral and cross walls thick; content opaque; head multicellular, Globose with irregular lobes; cells rounded, clustered ; outer wall thin, vesiculate; content granulated opaque. (Fig. 11)

**Distb.:** Tendril, Leaves, Petal and Stamens.

**OTU-24. *Trichosanthes cordata*, Roxb.**

**This taxa shows twelve types of trichome (Plate 24, Fig. 1-12 )**

**1. Unic. Papillose : (Code AI)**

Foot: Not visible . Body: 1-celled , inflated like balloon; veriously shaped; wall thin, hyaline; content transluscent. (Fig. 1)

**Distb. :** Petals, Stamen, Ovary and Stigma.

**2. Unic. Arrect. : (Code A III)**

Foot: Simple, broad. Body: 1-celled, stout, arrect; base bulbous; tip pointed; wall very thick; lumen narrow; content granulated yellow (Fig. 2)

**Distb. :** Tendril, Leaves, Pedicel, Sepals and Ovary.

**3. Bic. Filiform . : (Code B)**

Foot: Simple. Body: 3-celled, acerate, filiform; tip rounded; lateral and cross wall normal; content transluscent. (Fig. 3)

**Distb. :** Tendril, Leaves, Sepals and Petals.

**4. Bic. Cylindrical : (Code C )**

Foot: Simple, broad. Body: 2-celled, dwarf, cylindrical; basal cell bulbous, olort; upper cell oblong; tip rounded; cross and lateral walls thin, smooth; lumen wide; content transluscent. (Fig. 4)

**Distb. :** Tendril, Stem, Leaves, Petals and Stamens.

**5. Bic. Belemnoid : (Code F)**

Foot: Simple, elevated. Body: 2-celled , differentiated; basal cell broad, rectangular, barrel shaped; upper cell very narrow, acuminate; tip acute; lateral wall thick; content dense, yellow . (Fig. 5)

**Distb. :** Stem, Petiole, Leaves, Tendril, Sepals and Ovary.

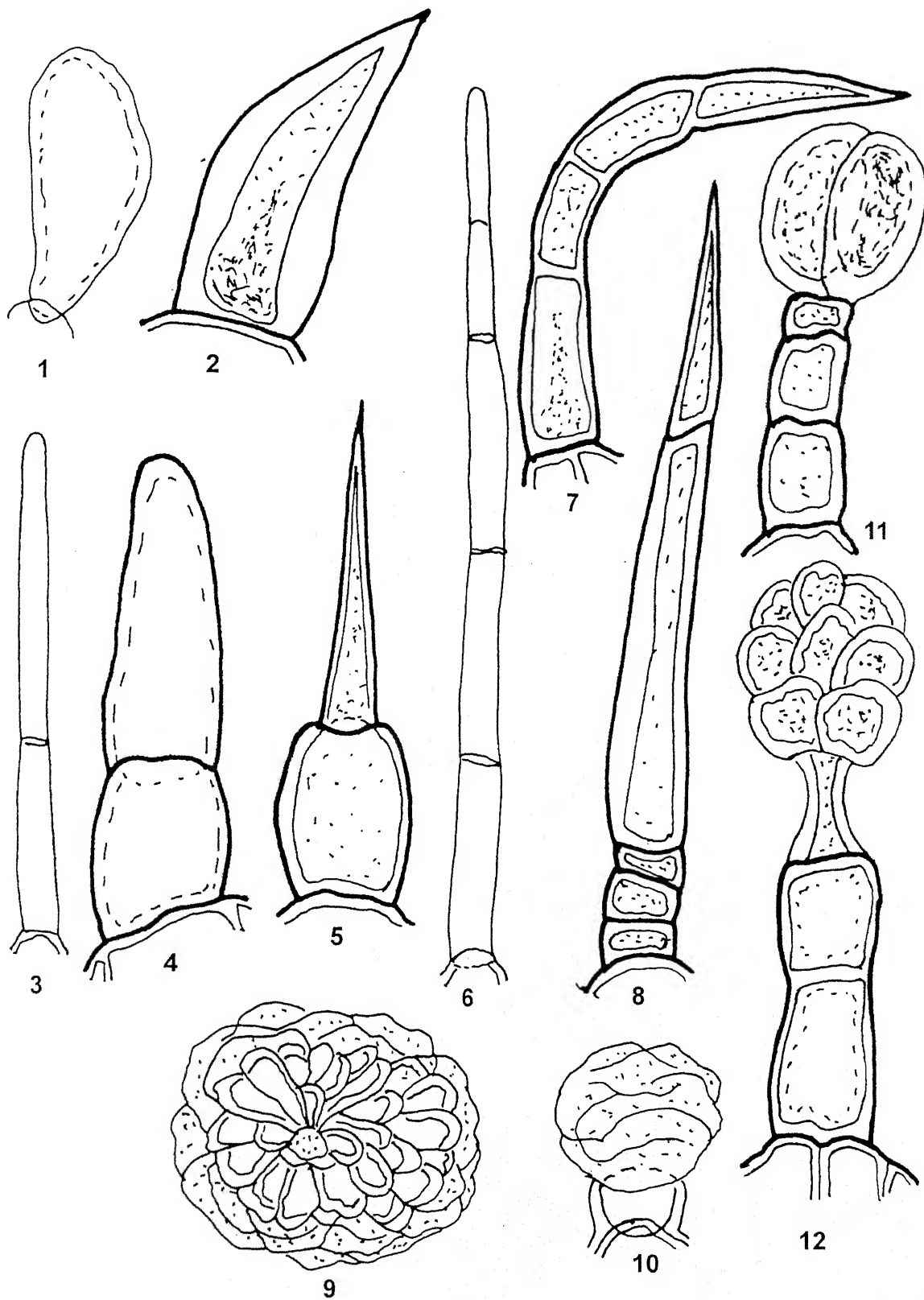
# EXPLANATION OF PLATE-24

Fig. No.	Trichome Type	Mgn.
1.	Unic. Papillose	Hx10
2.	Unic. Arrect	Hx10
3.	Bic. Filiform	Hx10
4.	Bic. Cylindrical	Hx10
5.	Bic. Belernnoid	Hx10
6.	Unis. Filiform	Hx5
7.	Unis. Hooked	Hx5
8.	Unis. Conical	Hx5
9.	Peltate	Hx10
10.	Unis. Gld. Cap.	Hx10
11.	Unis. Gld. 2-celled. Cap.	Hx10
12.	Unis. Neck-celled. Gld.Cap.	Hx5

# EXPLANATION OF PLATE- 24

Fig. No.	Trichome Type	Mgn.
1.	Unic. Papillose	H x 10
2.	Unic. Arrect	H x 10
3.	Bic. Filiform	H x 10
4.	Bic. Cylindrical	H x 10
5.	Bic. Belemnoid	H x 10
6.	Unis. Filiform	H x 5
7.	Unis. Hooked	H x 5
8.	Unis. Conical	H x 5
9.	Peltate	H x 10
10.	Unis. Gld. Cap.	H x 10
11.	Unis. Gld. 2-celled. Cap.	H x 10
12.	Unis. Neck-celled. Gld.Cap.	H x 5

# PLATE-24



#### 6. Unis. Filiform : (Code G)

Foot: Simple. Body: 5-7 celled, acerate- filiform; cells very long than broad; tip rounded; lateral and cross walls thin; lumen normal; content granulated. (Fig. 6)

**Distb.** : Stem, Petiole, Leaves, Pedicel and Sepals.

#### 7. Unis. Curved : (Code J)

Foot: compound. Body: 4-5 celled, curved; cells of equal length; terminal cell conical; tip acute; lateral and cross walls thick; joint distinct; lumen wide; content thick yellow. (Fig. 7)

**Distb.** : Stem, Leaves, Sepals and Ovary.

#### 8. Unis. Conical : (Code K)

Foot: Simple, elevated. Body: 5-celled, differentiated; proximal 3 cells discoid, broader than long, dwarf, outer wall irregular, content dense yellow; penultimate cell very long, cylindrical, entire, lumen narrow, outer wall thick, smooth, content dense yellow; distal cell short, acuminate; tip acute; wall thick, content dense yellow. (Fig. 8)

**Distb.** : Stem, Petiole, Pedicel, Sepals and Ovary.

#### 9. Peltate : (Code O)

Foot: Not visible. Body: multicellular, discoid, irregularly spherical; cells small, petalous, arranged in many rings around a common center; outer wall thin, undulating, vesiculate; content dense golden yellow. (Fig. 9)

**Distb.** : Leaves and Ovary.



**10. Unic. Gld. Cap. : (Code P)**

Foot: Simple. Body: dwarf, differentiated; stalk very short, barrel shaped, hyaline, content translucent; head 1-celled, irregularly globose, outer wall thin, vesiculated; content granulated golden yellow. (Fig. 10)

**Distb. :** Leaves, Sepals, Petals, Stamens and Ovary.

**11. Unis. Gld. 2- celled Capitae : (Code V)**

Foot: Simple. Body: Differentiated; stalk 3-celled, erect; cells rectangular or discoid, distal cell smallest; wall thin, smooth; joints distinct; content opaque; head 2-celled, cells oval, isobilateral; outer wall thin, content dense, granulated, golden, yellow. (Fig. 11)

**Distb. :** Petiole, Leaves, Pedicel, Sepals, Petals and Ovary.

**12. Unis. Neck-celled Gld. Capitae : (Code Y)**

Foot: Simple, emarginate. Body: Differentiated; stalk 3- celled, long, erect; lower two cells oblong, third, terminal cell biconcave like neck of the gland, lumen narrow; head multicellular, globose distinct; cells rounded and clustered; walls thick; content dense, granulated, golden, yellow. (Fig. 12)

**Distb.:** Stem, Tendril, Pedicel and Petals.



OTU – 25 *Trichosanthes cucumerina*, Linn.

This taxa shows thirteen types of trichome (Plate- 25, Figs. 1-13)

**1. Unic. Papillose : (Code A I )**

Foot: Simple. Body: 1-celled, papillose, clavate-shaped; wall thin, hyaline; tip rounded, body variously shaped; content translucent. (Fig. 1)

**Distb. :** Tendril, Leaves, Sepals, Petals, Stamen and Stigma.

**2. Unic. Falcate : (Code A V )**

Foot: Simple. Body: 1-celled, elongated, stiff, falcate shaped; tip acute; wall thick; lumen narrow; content dense, yellow. (Fig. 2)

**Distb. :** Stem, Tendril, Sepals and Ovary.

**3. Unic. Flagellate : (Code A VI )**

Foot: Simple, emarginate. Body: 1-celled , narrow, very long, irregular, flexible, flagellate; wall irregular; lumen variable; content translucent : (Fig. 3)

**Distb. :** Tendril, Pedicel, Petals and Stamens.

**4. Unic. Cylindrical : (Code A VII)**

Foot: compound . Body: 1-celled, elongated, balloon shaped, hyaline; tip rounded; wall entire, thin; lumen wide; content translucent. (Fig. 4)

**Distb. :** Tendril , Sepals, Petals and Ovary.

**5. Bic. Asept. Flagellate : (Code E)**

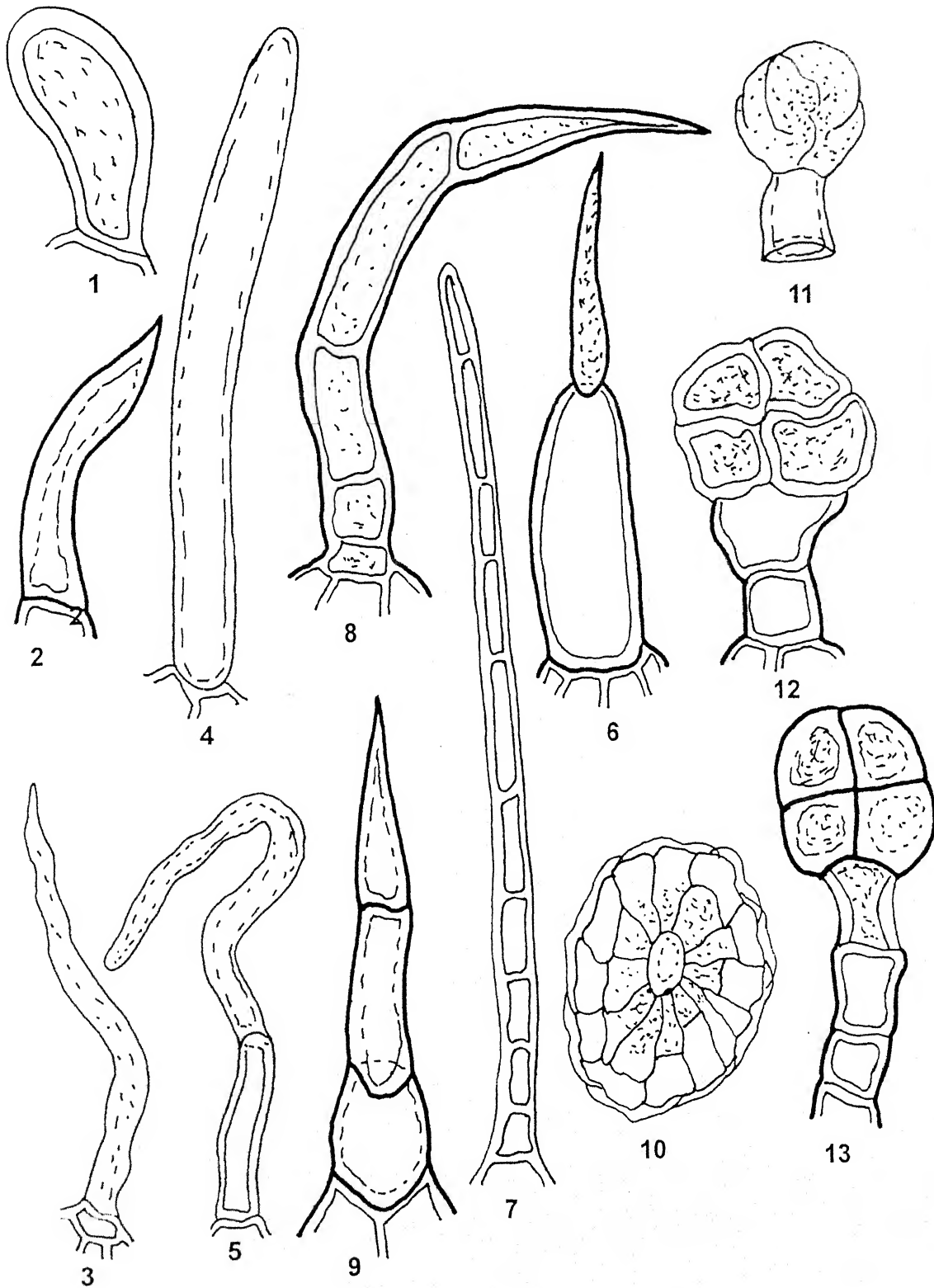
Foot: Simple. Body: 2-celled, differentiated; lower cell erect, tubular, filiform; upper cell very long, hyaline, irregular flagellate; wall of lower cell thick, lumen narrow, wall of upper cell irregular, lumen wide; content translucent. (Fig. 5)

**Distb. :** Sepals, Petals and Ovary.

## EXPLANATION OF PLATE- 25

Fig. No.	Trichome Type	Mgn.
1.	Unic. Papillose	H x 10
2.	Unic. Falcate	H x 10
3.	Unic. Flagellate	H x 10
4.	Unic. Cylindrical	H x 5
5.	Bic. Asept. Flagellate	H x 5
6.	Bic. Belemoid	H x 10
7.	Unis. Filiform	L x 10
8.	Unis. Hooked	H x 5
9.	Unis. Conical	H x 5
10.	Peltate	H x 10
11.	Unic. Gld. Cap.	H x 10
12.	Bic. Gld. 4-celled Cap.	H x 10
13.	Unis. Neck- celled. Cap.	H x 5

# PLATE-25



#### 6. Bic. Belemnoid : (Code F)

Foot: compound, elevated. Body: 2-celled, differentiated, basal cell oblong, cylindrical, basal part bulbous; upper cell narrow, acerate with bulbous base; tip acute, content dense and granulated. (Fig. 6)

**Distb.** : Petiole, Leaves and Sepals.

#### 7. Unis. Filiform : (Code G)

Foot: Simple. Body: multicellular, uniseriate, very long, filiform, 6-10 celled; cells unequal in length; cross wall distinct; lateral wall thin; tip rounded; content translucent. (Fig. 7)

**Distb.** : Stem, Petiole, Leaves, Pedicel and Sepals.

#### 8. Unis. Hooked : (Code I)

Foot: Emarginated simple. Body: 5-6 celled hooked, proximal cells rectangular; distal cell much elongated; terminal cell stiff, conical, tip sharp pointed; lateral and cross walls thick; joints geniculate; content granulated yellow. (Fig. 8)

**Distb.** : Stem, Leaves, Pedicel and Ovary.

#### 9. Unis. Conical : (Code K)

Foot: compound: Body : 3-celled, base shunked; basal cell ovate; middle cell columnar, cylindrical; terminal cell stiff, conical; lateral wall thick; content granulated, yellow. (Fig. 9)

**Distb.** : Stem, Petiole, Leaves, Pedicel and Sepals.

#### 10. Peltate : (Code O)

Foot: Not visible. Body: multicellular, peltate, 1-celled thick, parallel to epidermis; cells irregular, rosettedly arranged; outer wall hyaline, vesiculated; content granulated yellow. (Fig. 10)

**Distb.** : Stem, Pedicel and Ovary.

**11. Unic. Gld. Capitate. : (Code P)**

Foot: Not visible . Body: dwarf, differentiated; stalk very short, 1-celled, hyaline; head inflated, unicellular, globose; wall hyaline, thin, irregular; content granulated translucent. (Fig. 11)

**Distb.** : Tendril, Petals, Stamens and Stigma.

**12. Bic. Gld. 4-celled Capitate : (Code T)**

Foot: compound . Body: Differentiated; stalk 2-celled , dwarf; upper cell dilated; cells irregular; head 4- celled, cells irregular in outline; outer wall vesiculated; content granulated golden yellow. (Fig. 12)

**Distb.** : Tendril, Leaves, Sepals and Ovary.

**13. Unis. Neck-celled Gld. Capitate : (Code Y)**

Foot: Simple. Body: Differentiated; stalk 3-4 celled; cells rectangular; joints geniculate; terminal cell biconcave; head emarginated, 4- celled, globose, entire, dolliform; content granulated yellow. (Fig. 13)

**Distb.** : Stem, Petiole and Pedicel .

**OTU-26. *Trichosanthes bracteata*, (Lamk.) voigt. Hort.**

**This taxa shows thirteen types of trichomes. (Plate 26, Figs. 1-13)**

**1. Unic. Conical : (Code AII)**

Foot: Simple, hyaline. Body: 1-celled, dwarf, conical; base bulbous, distal part acuminate, tip acute; wall thick; lumen wide; content dense, granulated golden yellow. (Fig. 1)

**Distb. :** Tendril, Sepals, Petals, Ovary and Stigma.

**2. Unic. Cylindrical : (Code A VII)**

Foot: Simple, Body: 1-celled, long, cylindrical; wall thick; tip rounded; lumen wide; content translucent. (Fig. 2)

**Distb. :** Sepals, Petals, Stemens and Stigma.

**3. Bic. Cylindrical : (Code C )**

Foot: Simple, elevated. Body : 2-celled, broad, cylindrical; lower cell smaller than upper ; wall thin, lumen wide; cross wall thin; content translucent. (Fig. 3)

**Distb. :** Leaves, Tendril, Petals and Ovary.

**4. Bic. Conical : (Code D )**

Foot: Simple. Body: Dwarf, 2-celled, erect; upper cell longer than basal, acuminate; tip acute; lateral and cross walls thick; lumen normal content opaque. (Fig. 4)

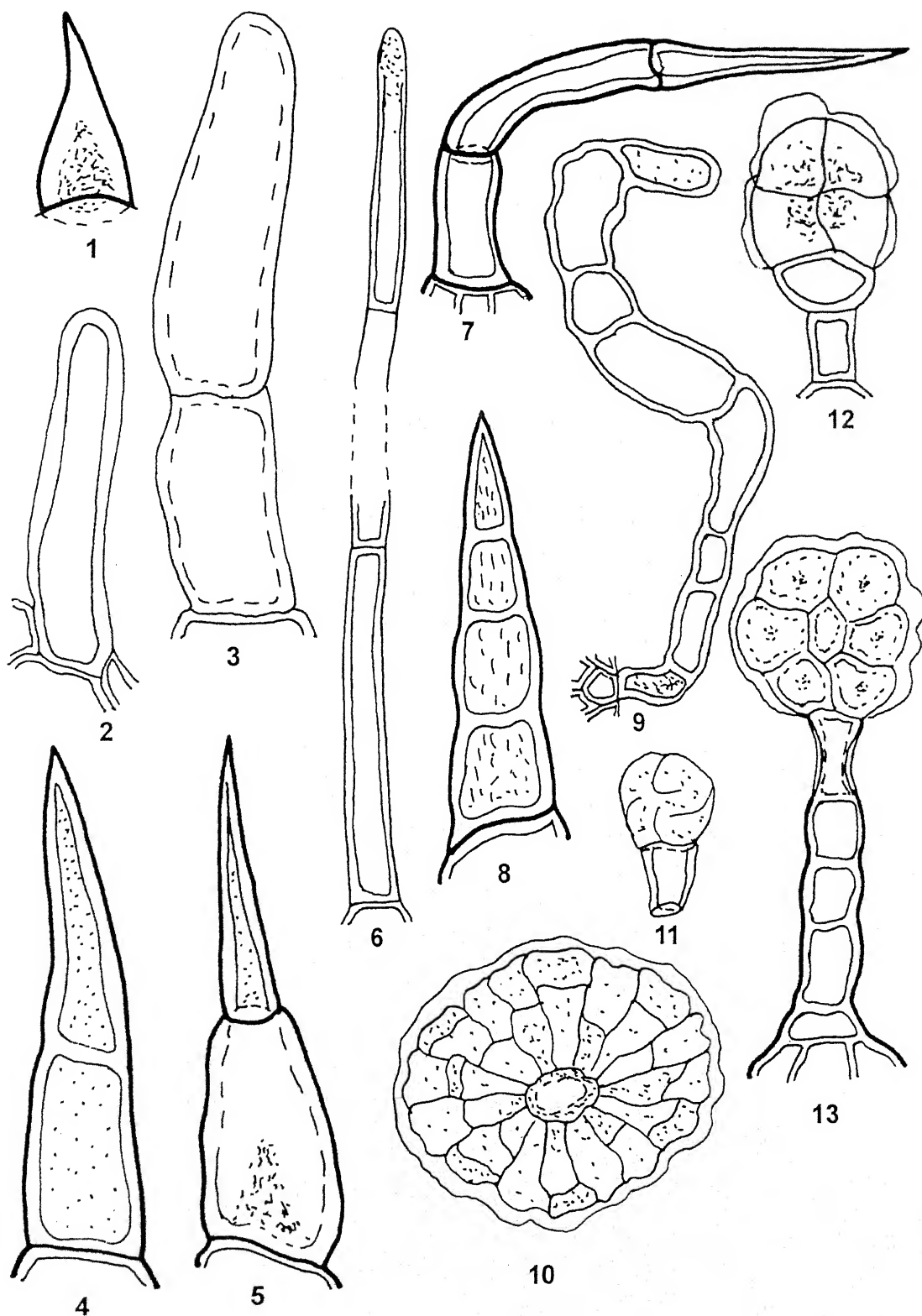
**Distb.:** Tendril, Leaves, Pedicel, Sepals and Ovary.



## EXPLANATION OF PLATE- 26

Fig. No.	Trichome Type	Mgn.
1.	Unic. Conical	H x 10
2.	Unic. Cylindrical	H x 10
3.	Bic. Cylindrical	H x 10
4.	Bic. Conical	H x 10
5.	Bic. Belemnoid	H x 10
6.	Unis. Filiform	L x 10
7.	Unis. Hooked	H x 5
8.	Unis. Conical	H x 5
9.	Unis. Sept. Flagellate	H x 5
10.	Peltate	H x 10
11.	Unic. Gld. Cap.	H x 10
12.	Bic. Gld. 4-celled Cap.	H x 10
13.	Unis. Neck-celled Gld. Cap.	H x 5

# PLATE-26





### 5. Bic. Belemnoid : (Code F)

Foot: Simple, emarginate, broad. Body: Differentiated; basal cell barrel shaped, large, base bulbous; upper cell narrow, acuminate; tip acute; wall thick; content dense granulated. (Fig. 5)

**Distb.** : Stem, Petiole, Pedicel, Sepal and Ovary.

### 6. Unis. Filiform : (Code G)

Foot: Simple. Body : 3-5 celled, filiform; cells very long, tubular, almost equal size; tip rounded; wall thin; lumen wide; content translucent. (Fig. 6)

**Distb.** : Stem, Petiole, Leaves and pedicel.

### 7. Unis. Hook : (Code I)

Foot: Compound. Body: 3-celled, uniseriate hooked; terminal cell straight, stiff, acuminate; tip acute; wall thick; joints geniculate; lumen narrow; content thick, yellow. (Fig. 7)

**Distb.** : Stem, Petiole, Leaves, Pedicel and Ovary.

### 8. Unis. Conical : (Code K)

Foot: Simple, elevated. Body : 4-6 celled, erect, conical; cells rectangular, basal cell bulbous, terminal cell narrowly acute; content dense, granulated. (Fig. 8)

**Distb.** : Stem, Petiole, Leaves and Pedicel.

### 9. Unis. Flagellate : (Code L)

Foot: Septate. Simple. Body : multicellular, uniseriate; cells irregular; outer wall irregular; body flexible, variously shaped; tip rounded; content translucent. (Fig. 9)

**Distb.** : Stem, Tendril, Pedicel, Sepals, Petals and Ovary.

**10. Peltate. : (Code O )**

Foot: Not visible. Body: multicellular, spherical, 1-celled thick, peltate; cells columnar, arranged around the central stalk rosettelly; outer wall thin, vesiculated; content golden yellow. (Fig. 10)

**Distb. :** Stem, Leaves and Ovary.

**11. Unic. Gld. Capitata : (Code P )**

Foot: Not visible. Body : dwarf, differentiated; stalk 1-celled, very small; head 1-celled, globular; outer wall thin vesiculated; content granulated. (Fig. 11)

**Distb. :** Tendril, Leaves, Petals, Stamen and Stigma.

**12. Bic. Gld. 4-celled Capitata. : (Code T)**

Foot: Simple. Body : differentiated; stalk 2-celled, dwarf; head 4-celled, dolliform; outer wall inflated; cells rectangular; content granulated yellow. (Fig. 12)

**Distb. :** Stem, Tendril, Leaves and Sepals.

**13. Unis. Neck-celled Gld. Capitata (Code Y )**

Foot: Compound, emarginate. Body: Differentiated; stalk 4-6 celled, short, erect; basal cell discoid; terminal cell biconcave, elongated, lumen narrow; head rounded, multicellular in regular fashion; outer wall thin and vesiculated. (Fig. 13)

**Distb. :** Stem, Leaves, Sepals and Ovary.

**OUT – 27 *Benincasa hispida*, (Thunb.) cogn.**

**This taxa shows Ten types of trichome (Plate 27 Figs. 1-10)**

**1. Unic. Papillose : (Code A1)**

Foot : Simple. Body : 1- celled, long, irregular, hyaline, inflated with many folds, papillose appearance; wall thin, smooth; content granulated, transluscent. (Fig. 1)

**Distb. :** Petals, stamen, and stigma.

**2. Unic. Flagellate : (Code A VI)**

Foot: Simple. Body : 1- celled , columnar, very long, flagellate; tip rounded and granulated; content transluscent. (Fig. 2)

**Distb. :** Tendril, Leaves, Sepals, Petals and ovary.

**3. Bic. Conical : (Code D)**

Foot: Simple. Body : 2 – celled , stiff, erect, conical; basal cell oblong, upper cell acuminate, tip sharply pointed; wall thick; lumen narrow, content dense, golden yellow. (Fig. 3)

**4. Unis. Filiform: (Code G)**

Foot: Simple. Body : 5- celled , very long, filiform; cells narrow, very long ; walls thin; lumen wide, content opaque (Fig. 4)

**Distb. :** Stem , Leaves, Pedicel, Sepal and ovary.

**5. Unis . Cylindrical : (Code H)**

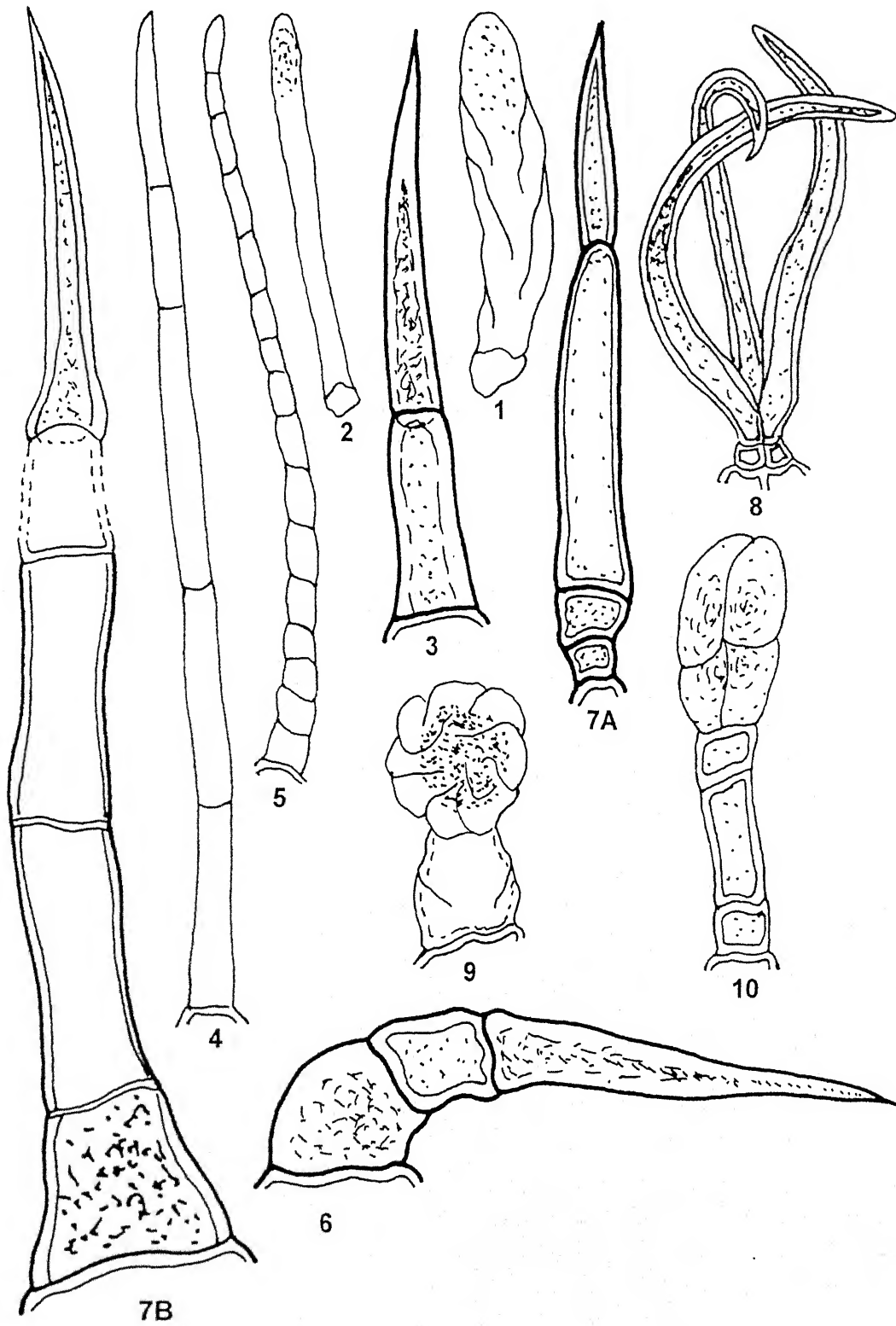
Foot : Simple. Body : 10-20 celled; cells small, barrel shaped, arranged uniseriately; terminal cell oblong, tip rounded; walls this; content opaque. (Fig. 5)

**Distb.:** Tendril, Sepals, Petals and Ovary.

## EXPLANATION OF PLATE- 27

Fig. No.	Trichome Type	Mgn.
1.	Unic. Papillose	H x 10
2.	Unic. Flagellate	H x 10
3.	Bic. Conical	H x 10
4.	Unis. Filiform	H x 5
5.	Unis. Cylindrical	L x 10
6.	Unis. Hooked	H x 5
7.A.	Unis. Conical	H x 5
7.B.	Unis. Conical	L x 5
9.	Stellate	H x 10
10.	Unic. Gld. Cap.	H x 10
11.	Unis. Gld. 4-celled. Cap.	H x 10

# PLATE-27



6. **Unis. Hooked** : (Code I )

Foot: Simple. Body : 3- celled ; lower 2- celled body bulbous and curved; terminal cell very long straight, gradually tapering to a sharp pointed tip; lumen narrow; content dense, granulated golden yellow. (Fig. 6)

**Distb.** : Stem, Petiole, Leaves and ovary.

7. **Unis. Conical** : (Code k)

Foot : Simple. Body: 2- types; (A)-4 – celled, lower 2 celled small rectangular; penultimate cell very long, cylindrical, terminal cell conical (Fig. 7A). (B)-5-8 celled, giant; cells oblong, large; basal cell bulbous with broad base, consist dense granulated content ; terminal cell longest; stiff, conical (Fig. 7B) wall thick, joint distinct ; content opaque.

**Distb.** : Stem , Petiole, Leaves, and Ovary.

8. **Stellate** : (Code N)

Foot : Emarginated simple. Body: Differentiated; stalk 1- celled thick, tufted with 3-5 multicellular, long, aciculate rays ; lateral wall thick ; lumen narrow, content yellow. (Fig. 8)

**Distb.** : Stem, Leaves, Pedicel and Ovary.

9. **Unic. Gld. Capitata** : (Code R )

Foot : Simple. Body : Differentiated; stalk 1-celled, hyaline, wall thin, infolded; body multicellular, inflated, irregularly globose; content granulated yellow. (Fig. 9)

**Distb.** : Tendril, Leaves, Petals, Stamen and Ovary.



**10. Unis. Gld. 4-celled Capitate: (Code W)**

Foot: Simple. Body : Differentiated; stalk 3-celled, uniseriate, cells of unequal size; head 4-celled , isodiametrical, oblong; surface entire; content dense, granulated yellow. (Fig. 10)

**Distb. :** Stem, Petiole, Sepal and Ovary.

OTU – 28. *Passiflora foetida*. L.

This taxa shows twelve types of trichome (Plate 28, Figs. 1-12)

**1. Unic. Papillose : (Code AI)**

Foot: Simple. Body: 1-celled, dwarf, papillose; wall thin, lumen wide; content translucent. (Fig. 1)

**Distb.** : Leaves, Sepals, petals , Stamens and Stigma.

**2. Unic. Conical : (Code A II)**

Foot: Compound, broad. Body: 1-celled, short, stiff, erect, dentate – conical ; tip acute; wall very thick; lumen narrow; content dense, granulated. (Fig. 2)

**Distb.** : Tendril, Petals, Ovary and Stigma.

**3. Unic. Curved : (Code A IV)**

Foot: Compound, sunken. Body : 1-celled , long, curved; tip pointed; lateral wall thick rugose; lumen wide; content dense opaque . (Fig. 3)

**Distb.** : Stem, Tendril, Petiole, Pedicel and Sepals.

**4. Unic. Flagellate : (Code A VI)**

Foot: Not visible. Body : 1-celled, very long, tubular, flexible, irregular, hyaline; tip oblong, vesiculate; wall thin, rugose; content translucent. (Fig. 4)

**Distb.** : Tendril, Petals , Ovary and Stigma.

**5. Bic. Conical : (Code D)**

Foot: Compound. Body : 2-celled, long, erect, conical; lower cell small, upper cell much longer, acuminate; tip acute; lateral and cross walls thick; rugose; lumen normal; content dense, granulated. (Fig. 5)

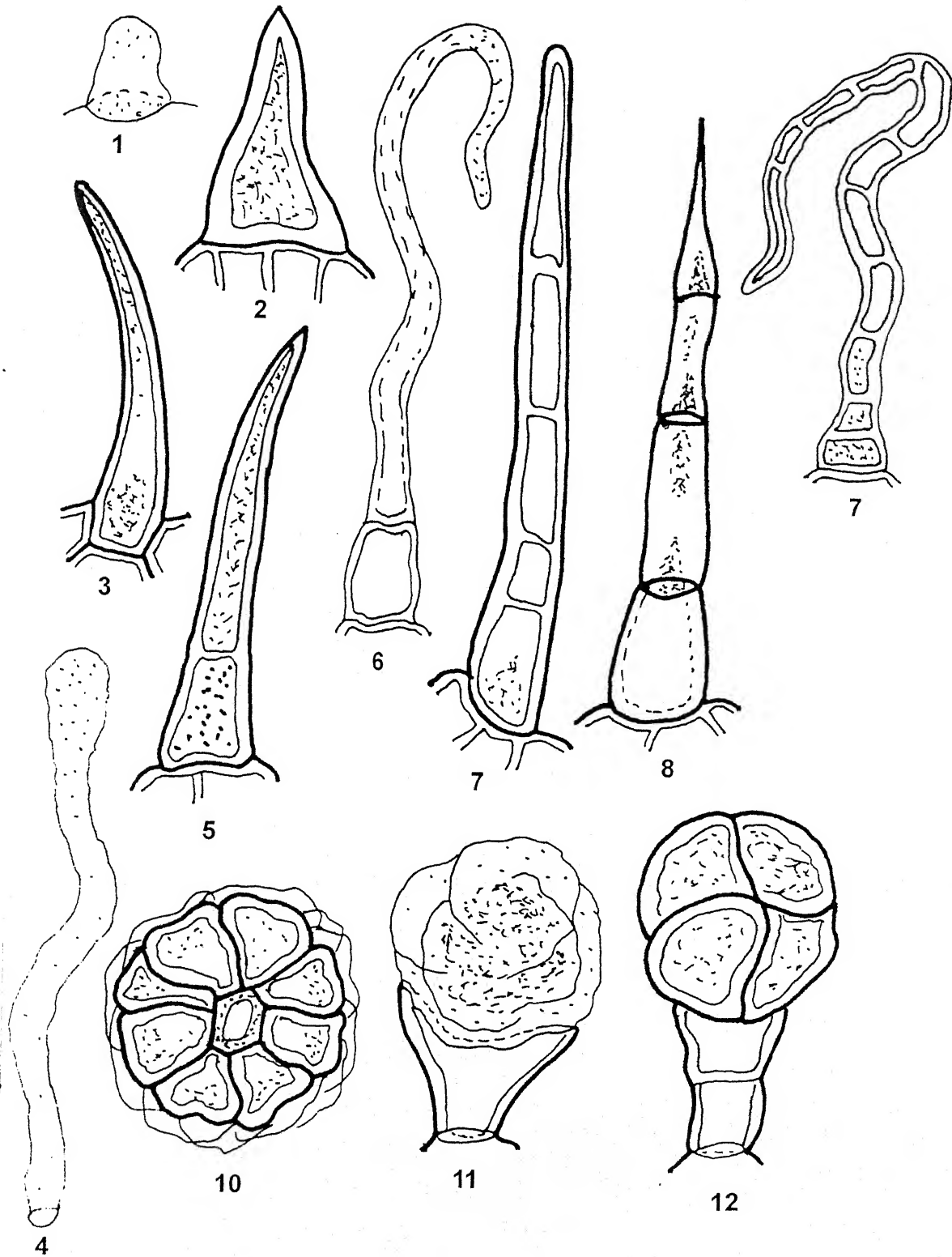
**Distb.** : Stem, Petiole, Leaves and Pedicel.



## EXPLANATION OF PLATE- 28

Fig. No.	Trichome Type	Mgn.
1.	Unic. Papillose	H x 10
2.	Unic. Conical	H x 10
3.	Unic. Curved	H x 10
4.	Unic. Flagellate	H x 5
5.	Bic. Conical	H x 5
6.	Bic. Asept. Flagellate	H x 5
7.	Unis. Filiform	H x 5
8.	Unis. Conical	H x 10
9.	Unis. Sept. Flagellate	H x 5
10.	Peltate	H x 10
11.	Unic. Gld. Cap.	H x 10
12.	Bic. Gld. 4-celled Cap.	H x 10

# PLATE-28



#### 6. Bic. Asept. Flagellate : (Code E )

Foot: Simple. Body : Differentiated, 2-celled ; lower cell small , rectangular, base bulbous; upper cell very long, hyaline, whiplash; tip rounded; content. of upper cell translucent, lower – dense, granulated. (Fig. 6)

**Distb. :** Tendril, Pedicel, Sepals, Petals, Stamens and Ovary.

#### 7. Unis. Filiform : (Code G )

Foot: compound, emarginate. Body: 5-6 celled , erect, long; tip rounded; cells unequal in length; joints distinct; lateral and cross walls thick; lumen narrow; content opaque. (Fig. 7)

**Distb. :** Stem, Petiole, Leaves and Pedicel.

#### 8. Unis. Conical : ( Code K )

Foot: compound, broad. Body : 3-4 celled, stiff, erect, conical ; basal cell broadest, gradually tapering to upper end; lateral wall entire, rugose; lumen narrow ; content dense, granulated, yellow. (Fig. 8)

**Distb. :** Stem, Petiole and Pedicel.

#### 9. Unis. Sept. Flagellate : (Code L )

Foot: Simple, Body: multicellular, differentiated; proximal region rigid, undulated; distal region flexible, whiplash; cells of unequal size; basal cell broadest; tip rounded; lumen narrow; content granulated opaque . (Fig. 9)

**Distb. :** Stem, Pedicel , Sepal, Petals and Ovary.

#### 10. Peltate : (Code O )

Foot: Not visible . Body: multicellular, spherical, peltate, 1-celled thick, parallel to epidermis, periphery irregular; cells rectangular, arranged around the common center; outer wall vesiculate, thin; content golden yellow. (Fig. 10)

**Distb. :** Stem, Tendril and Pedicel .

**11. Unic. Gld. Capitate : (Code P)**

Foot: Simple . Body : Differentiated ; stalk 1-celled , swarf, cupular, base narrow, upper part broad, wall thick; head 1-celled, highly inflated, rounded, wall thin, hyaline and vesiculated lobed; content granulated translucent. (Fig. 11)

**Distb. :** Tendril, Pedicel, Petals, Stamen and Ovary.

**12. Bic. Gld. 4-celled Capitate (Code T)**

Foot: Simple . Body: Differentiated; stalk 2-celled, very short; cells small, rectangular; head 4-celled, rounded, dolliform; outer wall thick, lobed, smooth; content dense, opaque. (Fig. 12)

**Distb. :** Pedicel, Leaves, Sepals and Petals.

OTU – 29. *Begonia Piota* . sm. Exot.

This taxa shows twelve types of trichomes (Plate 29 Fig. 1-12)

**1. Unic. Curved : (Code AIV )**

Foot: Simple. Body : 1-celled , stiff, sharply curved, tip acute, base broad; wall thick, rugose; lumen wide; content dense opaque. (Fig. 1)

**Distb.** : Stem, Petiole, Leaves and Pedicel.

**2. Unic. Flagellate : (Code AVI )**

Foot: Simple. Body: 1-celled, very long , narrow, flexible, unequal in breadth, tip rounded; wall thin , hyaline; lumen normal; content transluscent. (Fig. 2)

**Distb.** : Petiole, Leaves, Pedicel, Sepals, Petals, ovary and Stamens.

**3. Bic. Conical : (Code D )**

Foot: compound, emarginate. Body : 2-celled , erect, stout; cells of equal size; proximal end of basal cell broadened; tip pointed; wall thick, tubercled; content dense yellow. (Fig. 3)

**Distb.** : Stem, Leaves, Pedicel , Sepals and Ovary.

**4. Bic. Asept. Flagellate : (Code E )**

Foot: compound. Body: Differentiated; basal cell long, clavate; lateral wall thick, content opaque; upper cell long, cylindrical, flagellate; wall thin, lumen wide; content transluscent. (Fig. 4)

**Distb.** : Leaves, Pedicel , Sepals, Petals and Ovary.

**5. Unis. Filiform : (Code G )**

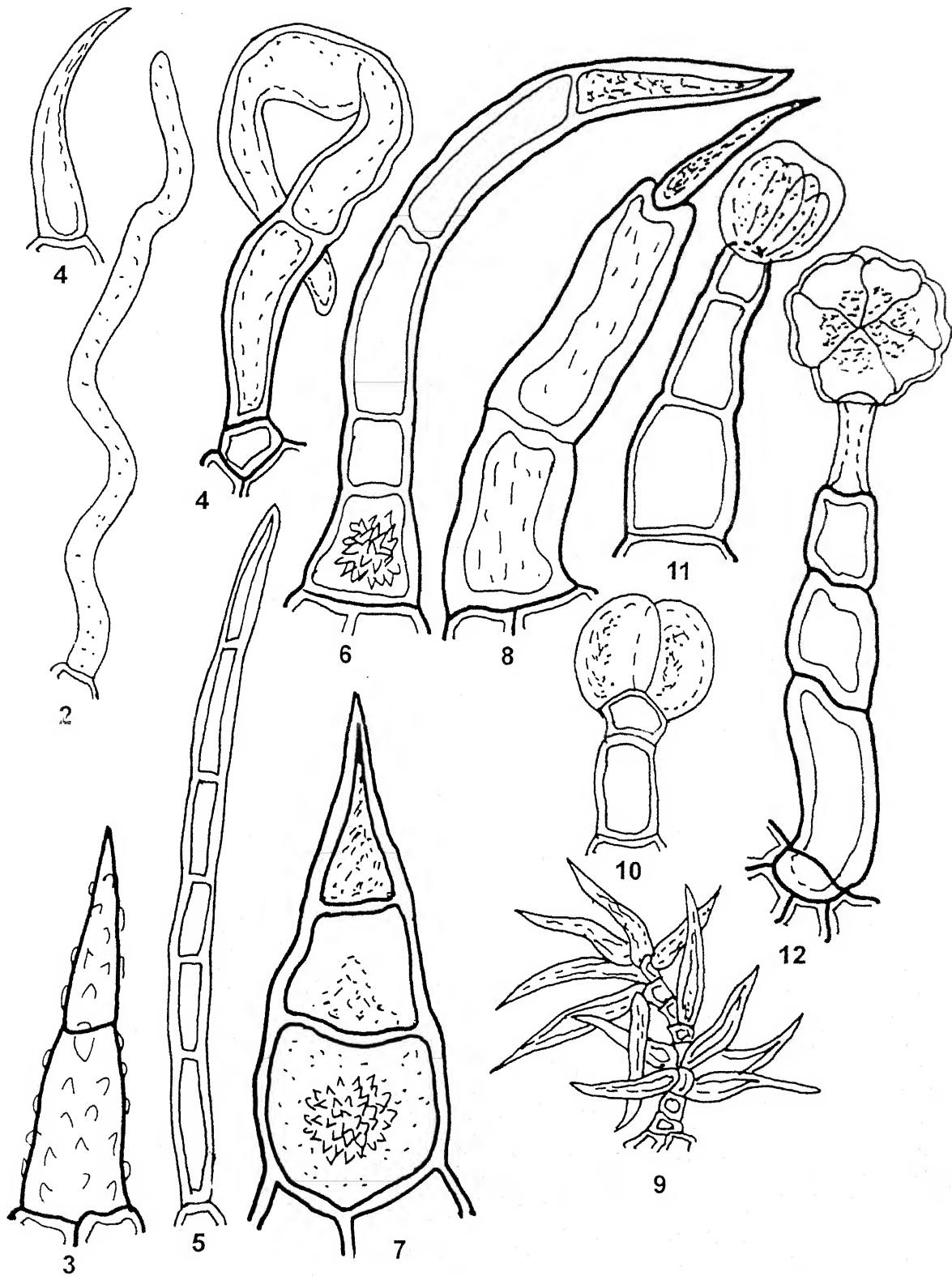
Foot: Simple, elevated. Body : 5-6 celled, erect, filiform; cells unequal; cross walls thick, joints distinct, lateral wall thin; lumen narrow; content granulated (Fig. 5)

**Distb.** : Stem, Leaves, Pedicel and Sepals.

## EXPLANATION OF PLATE- 29

Fig. No.	Trichome Type	Mgn.
1.	Unic. Curved	H x 10
2.	Unic. Flagellate	L x 10
3.	Bic. Conical	H x 5
4.	Bic. Asept. Flagellate	H x 5
5.	Unis. Filiform	L x 5
6.	Unis. Curved	H x 5
7.	Unis. Conical	H x 5
8.	Unis. Belemnoid	H x 5
9.	Stellate	H x 5
10.	Bic. Gld. 2-celled Cap.	H x 10
11.	Unis. Gld. 4-celled Cap.	H x 10
12.	Bic. Neck-celled Gld Cap.	H x 10

# PLATE-29





#### 6. Unis. Curved : (Code J )

Foot: compound, broad. Body: 5-6 celled curved, differentiated; basal cell rectangular, base broad, cystolith in lumen; terminal cell long, stiff, acuminate, tip acute; lateral and cross walls thick; lumen narrow; content granulated golden yellow. (Fig. 6)

**Distb. :** Stem, Leaves, Pedicel and Ovary.

#### 7. Unis. Conical : (Code K)

Foot: compound. Body: 3-celled, differentiated; basal cell much broader, yellow, crystalline content, seated over concave base; terminal cell triangular, sharply tapering to a acute tip; lateral and cross walls thick; joints distinct; content dense, golden yellow; joints distinct; content dense, golden yellow. (Fig. 7)

**Distb. :** Stem, Petiole and Leaves.

#### 8. Unis. Belemnoid : (Code M)

Foot: compound, broad. Body: 3-celled, differentiated; lower two cells long and much broader, wall thick, lumen narrow, content granulated opaque; terminal cell very narrow, base rounded, tip narrow acute; wall thick, content dense, granulated yellow. (Fig. 8)

**Distb. :** Stem, Petiole, Leaves and Pedicel.

#### 9. Stellat : ( Code N )

Foot: compound. Body: multiradiate, dendroid forms, differentiated; axis of very small , rectangular cells; arms unicellular, lanceolate, base broader; distal end acuminate; lumen narrow; content granulated, yellow (Fig. 9)

**Distb. :** Stem, Petiole, leaves and Pedicel .



**10. Bic. Gld. 2-celled Capitate. : (Code S )**

Foot: Simple. Body: Differentiated; stalk 2-celled, lower cell large oblong, cylindrical, upper cell rectangular, collared; head 2-celled; cells large hemispherical, bicolateral; outer wall thin, lobed; content granulated opaque. (Fig. 10)

**Distb.:** Leaves, Sepals, Petals and Stigma.

**11. Unis. Gld. 4-celled Capitate : (Code W )**

Foot: Simple, broad. Body: Differentiated; stalk 3-celled, basal cell large, barrel shaped, rest normal, lateral and cross walls thick, content translucent; head 4-celled, vesiculated, rounded, cells arranged in palisade manner; content granulated, translucent. (Fig. 11)

**Distb. :** Stem, Pedicel and Sepals.

**12. Unis. Neck – celled Gld. Capitate : (Code Y )**

Foot: compound. Body: Differentiated ; stalk 4-celled, basal cell longest, cylindrical, erect; middle two cells rectangular; terminal cell biconcave, narrow like neck of the trichome, lumen narrow; head multicellular, regular, rounded, cells arranged in a ring; outer wall undulating; content dense, granulating, yellow. (Fig. 12)

**Distb. :** Stem, Petiole, Leaves, Pedicel and Ovary.

## CHAPTER-IV.

# OBSERVATION AND DISCUSSION

## CHAPTER-IV

### OBSERVATION & DISCUSSION

In the present study a detailed investigation of morphology and organographic distribution of vegetative and floral trichomes in 29 taxa belonging to fourteen genera of three families (viz. Cucurbitaceae, Passifloraceae and Begoniaceae) of Passiflorales has been taken into consideration. Out of 29 taxa, 27 species belong to Cucurbitaceae and one each of passifloraceae and Begoniaceae respectively. Thus, taxa of cucurbitaceae are predominant in present study. (Table -1)

Trihcomes of Cucurbitaceae are extensively studied and classified by Metcalfe and Chalk (1950):

- I. Simple, unicellular or uniseriate, sometimes composed of 2-3 cells at the base.
- II. Wart-like or spiny trichomes in species of *Bryonia*, *Cucumis*, *Cucurbita*, *Ecballium*.
- III. Glandular hairs with uniseriate stalks of variable length and spherical or disc shaped heads in species of *Abobra*, *Benincasa*, *Citrullus*, *Corallocarpus*, *Cucumis*, *Cucurbita*, *Cyclanthera*, *Ecballium*, *Fevillea*, *Gynostemma*, *Kedrostis*, *Lagenaria*, *Luffa*, *Melothria*, *Momordica*, *Trichosanthes*, *Zanonia*.
- IV. Explosive hairs with uniseriate stalks of 5 or 6 cells and 2-celled heads in *Cucurbita* and *Momordica*. According to Zimmerman (1922) the whole head of each hair is explosively cast off and the contents extruded through the pore thus formed.

- V. Water-containing hairs, chiefly situated at the leaf margins; those of *Momordica* spp. Multicellular, elongated; with pointed apices in species of *Bryonopsis*, *Coccinia*, *Melothria*, *Raphanistrocarpus*.
- VI. A network of uniseriate hairs, covered with waxy material, recorded in *Telfairia*.
- VII. Hooked calcified hairs in *Peponium*.

Recently Inamdar and Gangadhara (1975) studied the trichomes in certain members of Cucurbitaceae. They included both vegetative and floral trichomes in their studies and classified them into glandular and nonglandular. 13 main types and 26 sub- types of glandular and non-glandular trichomes have been reported by these workers. According to them all the types of trichomes originated from a single papillate hair initial. They classified the trichomes on the basis of form, structure and contents.

A. Shaggy, uniseriate, multicellular long hairs with blunt tip glandular hairs with uniseriate stalk and multicelled head.

- a) Uniseriate hair with three celled head and a long central cell in the stalk  
glandular hairs rare on tendril

**Momordica charantia**

- b) Long, loose, uniseriate hairs common on stem ridges and young tendrils glandular hairs in furrows

Luffa cylindrica

- c) Short, pointed, bent, stiff hairs over stem ridges and along laminar veins. Tendril smooth.

Bryonia laciniosa

- c) Long, wooly, uniseriate hairs common, glandular rare.

Lagenaria

siceraria

- B. Pointed, uniseriate hairs common on stem but rare on lamina, Water containing hairs seen. Glandular 4-celled head hairs common on petiole, lamina and tendril

Trichosanthes cucumerina

- C. Long, pointed, stiff hairs common on ridges above vascular bundles but absent in furrows of stem. Glandular hairs rarely present.

- a) Multicelled head glandular hairs. Pointed, uniseriate hairs with broad base.

Cucurbita species

- b) Glandular hairs rare but 3 uniseriate celled head, 4-celled, uniseriate hairs with multicelled base.

Cucumis sativus

- D. Pointed, tapering, uniseriate hairs acanty. Glandular hairs with mutiseriate head. One celled spherical hairs with biseriate stalk also present.

Sicyos angulatus

E. Pointed and blunt tip short hairs scanty glandular hairs with 4 celled head and uniseriate stalk common in furrows of young stem.

(a) Hairs scanty on stem, glandular

Hairs less on dorsal surface of  
leaf lamina.

Cyclanthera explodens

(b) Stem mostly smooth. Glandular

Hairs equal on both surfaces of  
leaf lamina.

Cyclanthera pedata

In present study total 31 trichome types, both Non-glandular and glandular has been recorded. Taxonomic evaluation of these trichome types has also been done successfully.

Among recorded 31 trichomes, 21 belong to 5 categories of Non-glandular (viz. Unicellular, Bicellular, uniseriate, stellate and Peltate) and rest 10 belong to 3 categories (viz. Unicellular stalk, Bicellular stalk and uniseriate stalk) of Glandular Trichomes (Table-2).

On the basis of shape, number of cells, habit and arrangement, Non-glandular trichomes further Sub-categorised into 21 types. Further, among these Non-glandular forms, uniseriate types are more abundant (9 types) followed by unicellular (7 types) and Bicellular (5 types).

On the other hand, Glandular trichomes further sub – categorised into 10 types considering number of cells present in the head viz.

Unicellular glandular capitate, unic.Gld. 2-celled cap.; unic. Gld. 4-celled cap.; Bic.Gld. 2-celled cap.; Bic. Gld. 4-celled cap.; Bic. Gld. M-celled cap.; unis .



Gd. 2-celled cap; unis. Gld. 4-celled cap; unis. Gld. M-celled cap. and unis. neck-celled Gld. cap. (Table-6).

The perusal of Tables 3,4 and 5 reveals that most of the trichomes are present on both vegetative and floral parts, where as, some are restricted to vegetative parts only. It is also interesting to note that some of the trichomes types are freely observed on Leaves margin, Stamen and Gynoecium of certain taxa only. Thus, this type of occurrence provide taxonomic significance to trichomes and act as taxonomic marker. Some trichomes are common to most of the taxa while others are not so common.

Among Non-gld. trichomes, Uniseriate Filiform (G) and Uniseriate Conical (K) trichomes are observed in 23 taxa. Uniseriate Hooked (I) in 22 taxa; Unicellular Papillose (AI) in 20 taxa; Bicellular Conical (D) and Unicellular Conical (AII) in 16 and 15 taxa respectively. On the other hand, Bicellular Belemnoid (F) and Uniseriate Curved (J) recorded on 12 taxa and Unicellular Flagellate (AVI), Uniseriate Cylindrical (H) & Peltate types show presence on different parts of 11 taxa. Rest of the recorded trichome types have presence on 10 or less taxa. For example Uniseriate, Septate Flagellate (L) and Unicellular Arrect (AIII) are observed on certain parts of 10 and 8 taxa only where as Bicellular Aseptate flagellate (E) and Stellate (N) are restricted to 6 and Unicellular Curved (AIV); Unicellular Falcate (AV) , Bicellular Filiform (B) Bicellular Cylindrical (C) and Uniseriate Belemnoid (M) are restricted to only 5 of the taxa studied in order Passiflorales. Unicellular Cylindrical (AVII) is the only trichome type which recorded only on certain organs of 4 taxa providing taxonomic significance .

Among the glandular trichome, 4 types are observed in more than 10 taxa. They are, Uniseriate Neck-celled Glandular Capitate in 15 taxa, and Bicellular Glandular 4-celled Capitate & Uniseriate Glandular M-celled Capitate in 12 taxa. Glandular trichomes, which are observed in less then 10 taxa are: Uniseriate

TABLE -2. TOTAL TRICHOME TYPES OBSERVED IN PRESENT STUDY.

A. NON-GLANDULAR TRICOMES			CODE
1.	Unicellular	Popillose	A I
2.	Unicellular	Conical	A II
3.	Unicellular	Arrect	A III
4.	Unicellular	Curved	A IV
5.	Unicellular	Faleate	A V
6.	Unicellular	Flagillate	A VI
7.	Unicellular	Cylindrical	A VII
8.	Bicellular	Filiform	B
9.	Bicellular	Cylindrical	C
10.	Bicellular	Conical	D
11.	Bicellular	Asept. Flagellate	E
12.	Bicellular	Belemnoid	F
13.	Uniseriate	Filiform	G
14.	Uniseriate	Cylindrical	H
15.	Uniseriate	Hooked	I
16.	Uniseriate	Curved	J
17.	Uniseriate	Conical	K
18.	Uniseriate	Sept. Flagellate	L
19.	Uniseriate	Belemnoid	M
20.	Stellate		N
21.	Peltate		O



TABLE -2. TOTAL TRICHOME TYPES OBSERVED IN PRESENT STUDY.

<u>B.</u> GLANDULAR TRICHOMES	CODE
1. Unicellular Glandular Capitate	P
2. Unicellular Glandular 2-celled Capitate	Q
3. Unicellular Glandular 4-celled Capitate	R
4. Bicellular Glandular 2-celled Capitate	S
5. Bicellular Glandular 4-celled Capitate	T
6. Bicellular Glandular m-celled Capitate	U
7. Uniseriate Glandular 2-celled Capitate	V
8. Uniseriate Glandular 4-celled Capitate	W
9. Uniseriate Glandular M-celled Capitate	X
10. Uniseriate Neck-celled Glandular Capitate	Y

TABLE - 3A: ORGANOGRAFIC DISTRIBUTION OF TRICHOMES IN THE TAXA OF PASSIFLORALES

OTU'S NAME OF TAXA	STEM	TENDRIL	PETIOLE	LEAVE UPPER	LEAVE LOWER	LVS. MARGIN	PEDICEL(FEMALE)	PEDICEL(MALE)
1 <i>Citrullus vulgaris</i>	DGIKWTX	BDHP	DGKW	AII DJKT	AII DJKI	D	DGIKW	DGKW
2 <i>C. fistulosus</i>	AII, DFIKY	AII, AVI, Q	IK	FIJY	AII, FJKQ	Q AII K	AII DKOY	AII, DKO
3 <i>Coccinia cordifolia</i>	AV, BEJKOTV	AV, BET	AV, BJK	AV, AVI, BFTV	AV, AVI, FT	AV	BEFJKV	BEJK
4 <i>Ctenolepis garcinii</i>	AII, DGIKW	DIJLT	AII, GIKL	DGKLRW	DGKR	AII R	AII GIKW	AII, IKW
5 <i>Cucumis melo</i>	AII, AII, FGKNOY	AII, GU	AII FNY	AII, AII, FKNOU	GKOUY	AII, AII	AII FKN	AII, KN
6 <i>C. var. momordica</i>	DGIMV	AII, EMRS	DGMV	DEGIV	EV	DI	IMSV	IMS
7 <i>C. var. utilissimus</i>	FGIK	FHK	FGIK	FGIKVX	GIVX	I	GK	GK
8 <i>C. sativus</i>	DIKNOWX	AV, AVI, DKX	DIKNX	AVI, DIKNX	AVI, IUW		AVDINOW	DINO
9 <i>C. trigonus</i>	GIKLSY	IQ	AII, GIY	AII, GIKSY	GISY	AII	GIY	GI
10 <i>Cucurbita maxima</i>	FKI	DJ	FK	DFKIW	DFI	IW	FKIJ	FKI
11 <i>C. pepo</i>	KIMTVY	DGIT	DIX	DGKMTY	DGMY	Y	KIMY	KI
12 <i>C. moschata</i>	AII, FGIJTW	FGT	AII, GIJW	AII, FGIW	AII, GW	AII	AII GIJ	AII, GI
13 <i>Diplocyclos palmatus</i>	AII, DHJKR	AVI, R	AII, DH	DJKORW	DJKO	W	AII DHW	AII, HW
14 <i>Lagenaria vulgaris</i>	BDGIX	AI, AV, JL	AVBDGIX	AI, AV, BDR	AI, GLR		AVDGIJX	AVGJX
15 <i>Luffa acutangula</i>	AII, AV, GKOVY	AVI, T	AII, GKOVY	AV, FGOT	AI, GKV	AV	AII GKOVY	AII, GV
16 <i>L. echinata</i>	AII, DIKOVY	AV, GKP	AVIXY	AII, AV, DIKY	AII, IPX	P	AII DIPX	AII, IPX
17 <i>L. cylindrica</i>	GIKLR	AV, HKL	GIKX	GKLRX	GKLS	S	HIKX	HIK
18 <i>Melothria maderaspatana</i>	AII, AII, DIMTX	AII, DT	AII, K	AII, AII, DITX	AII, DPX	AII, I	AII, AII, DKM	AII, AII, K
19 <i>Momordica charantia</i>	AII, GIMV	AII, GL	AII, V	AII, IMVW	IM	AII W	GL	GL
20 <i>M. dioica</i>	AII, FGIKU	FU	AII, FI	AII, IUY	AII, IY	U	FGU	FGU
21 <i>M. balsamina</i>	AII, AII, GIW	AI, G, L, R	AI, AII, G, I	AI, AII, GHW	AI, F, G, I, J, W	AI	AII, AII, FJUW	AII, FGJUX
22 <i>Trichosanthes dioica</i>	AII, EGJKOW	AII C	AV, EGJKW	AV, JKOW	AII, AV, S	JW	AVI, EGW	AVI, E, G, W
23 <i>T. anguina</i>	AII, BDGJNOT	AII, BPX	DGJNT	AI, BDJTX	BGJX	AII D J	AII DNO	AII, DGO
24 <i>T. cordata</i>	CFGJKY	AII, BCFY	FGKV	AII, FGJOV	BCOP	AII FJP	AII, GKY	GKVY
25 <i>T. cucumerina</i>	AV, GIKOY	AI, AV, AVI, AVI, PT	FGKY	AI, FGKT	AI, FGK	I	AVIGIKOY	AVIGIKOY
26 <i>T. bracteata</i>	FGIKLOTY	AII, CDLPT	FGIK	CDGIKOPY	CDGPT	I	DFGIKL	DGKL
27 <i>Benincasa hispida</i>	DGIKNW	AVI, DHP	DIKW	AVI, GKN	AVI, DKP	IW	GN	GN
28 <i>Passiflora foetida</i>	AII, AVI, DGKLO	AV, AVI, EOP	AVDGK	AI, AII, DGT	DG	AII	P	AII, AVI, DEGLOP
29 <i>Begonia picta</i>	AV, DGJKNWY		AV, AVI, KMNY	AV, DEGJKNY	AV, AVI, EKMS	AVI J	DEGJNWY	AV, AVI, GJMY

TABLE - 3B: ORGANOGRAPHIC DISTRIBUTION OF TRICHOMES ON FLORAL PARTS IN THE TAXA OF PASSIFLORALES

OTU'S	NAME OF TAXA	MALE FLOWER				FEMALE FLOWER			
		SEPAL	PETAL	STAMEN	SEPAL	PETAL	OVARY	STIGMA	
1	<i>Citrullus vulgaris</i>	AlI, DGPW	Al, BDPT	Al, P	AlI, DGIJPTW	Al, AlI, BDHPT	HP	Al, AlI	
2	<i>C. fistulosus</i>	AlI, AlII, JKQ	AVI, Q SX	AVI, Q	AlI, AlII, FJKY	AlI, AVI, SX	AlI, AlI, DFIKQ SX	AVI, Q	
3	<i>Coccinia cordifolia</i>	AV, BTV	AVI, AVII, ET	AVII	AV, AVI, BFTV	AVI, ET	AVI, AVII, O	AVI	
4	<i>Ctenolepis garcinii</i>	DJKRT	HLRT	R	Al, DJKT	Al, HLT	AlI, DHJLW	Al, R	
5	<i>Cucumis melo</i>	AlI, GK	Al, HU	Al	AlI, AlII, GKUY	Al, HU	AlII, HKOUY	Al	
6	<i>C. var. momordica</i>	AlI, DGIR	Al, ER	Al, R	AlI, DEGRS	Al, AlI, ER	Al, AlI, R	Al, R	
7	<i>C. var. utilissimus</i>	FGIX	Al, HPV	P	FGHIJ V X	Al, H V	I J X	Al, P	
8	<i>C. sativus</i>	I KUW	Al, AVII, U X	Al, AVII, U	AV, I KUW	Al, AV, AVII, U X	Al, AV, DOU	Al, AVII,	
9	<i>C. trigonus</i>	AlII, GKLQ	CLQ	Al	AlII, GKLQS	CLQ	Al, CL	Al	
10	<i>Cucurbita maxima</i>	DFJ	LPTWY	Al, LP	DFKJT	DJLPTWY	Al, DPW	Al, P	
11	<i>C. pepo</i>	DGKIMT	AVI, GX	Al, AVI	DGKIMTY	AVI, GVXY	Al, AVI, RV	Al, R	
12	<i>C. moschata</i>	GJW	HLT	R	AlI, GJW	HLT	FGILRT	AlI, LR	
13	<i>Diplocyclos palmatus</i>	AVI, JW	Al, AVI, R	AVI	DJR W	Al, RW	Al, AVI, DOR	R	
14	<i>Lagenaria vulgaris</i>	AV, BDJ	BJ	Al	AV, BDIJ	BJLR	Al, JLR	Al	
15	<i>Luffa acutangula</i>	AlI, GTV	Al, FTV	Al, T	AlI, FGV	Al, FTV	Al, AV, FGKOT	Al	
16	<i>L. echinata</i>	AV, DJKX	AlI, P	GP	AV, DGKXY	AlI, AV, GP	AlI, DIKOPX	G	
17	<i>L. cylindrica</i>	AV, GRS	AVI, HLS	AVI	AV, GKRSX	AV, AVI, HL	AV, AVI, HLRX		
18	<i>Melothria maderaspatana</i>	AlI, DK	AVI, P	AVI	AlI, AlII, DKP	AVI, PTX	AlI, AVI, IPTX	AVI	
19	<i>Momordica charantia</i>	AlI, GIV	Al, HLWY	Al	AlI, GILMV	Al, HLWY	LY	I	
20	<i>M. dioica</i>	GI	Al, HY		AlII, GIKY	Al, HY	AlII, FIKU		
21	<i>M. balsamina</i>	FHJU	CHLRUX	A CR	FHJLUX	CHLRUX	HLRUX	Al, AlI, CLR	
22	<i>Trichosanthes dioica</i>	AVI, ES	AVI, CES	AVI	AVI, CEO	AVI, CES	AV, AVI, CO	AVI	
23	<i>T. anguina</i>	Al, AlI, JP	Al, P X	P X	Al, AlI, JT	Al, P X	Al, BO	P	
24	<i>T. cordata</i>	BGKPV	Al, BCPY	Al, CP	AlII, BFGJK	Al, BPVY	Al, AlII, FJKOPV	Al	
25	<i>T. cucumerina</i>	Al, AV, FGKT	Al, AVI, EP	Al, AVI, P	Al, AV, AVII, EFGKT	Al, AVII, E	AV, AVII, E IOT	Al, P	
26	<i>T. bracteata</i>	AlI, AVII, DLY	AVII, LP	AVII, P	AlI, DLT Y	AlI, AVII, C FLP	AlI, C D F I O P Y	AlI, AVII	
27	<i>Benincasa hispida</i>	AVI, DG	Al, AVI, HP	Al, P	AVI, DGHW	Al, AVI, H	AVI, GHIKNPW	Al	
28	<i>Passiflora foetida</i>	Al, AV, ET	Al, ELPT	Al, EP	Al, AV, ELT	Al, AVI, ELPT	Al, AlI, AVI, ELP	Al, AVI	
29	<i>Begonia picta</i>	AVI, DG	AVI, E	AVI	AVI, DEGSW	AVI, ES	AVI, DEJY	AVI, S	

TABLE -4A

TAXA WISE DISTRIBUTION OF NON - GLANDULAR TRICHOMES

## TRICHOME TYPE →

OTU'S	NAME OF TAXA	AI	AII	AIII	AIV	AV	AVI	AVII	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
1	<i>Citrullus vulgaris</i>	+	+						+		+			+	+	+	+	+					9
2	<i>C. fistulosus</i>		+	+			+			+	+		+			+	+	+			+		9
3	<i>Coccinia cordifolia</i>						+	+				+	+			+	+	+	+			+	9
4	<i>Ctenolepis garcinii</i>	+	+							+	+			+	+	+	+	+	+				9
5	<i>Cucumis melo</i>	+	+	+							+	+	+	+	+	+		+	+		+		9
6	<i>C. var. momordica</i>	+	+								+	+		+	+	+		+		+			7
7	<i>C. var. utilissimus</i>	+							+					+	+	+	+	+					7
8	<i>C. sativus</i>	+			+					+	+					+		+			+		8
9	<i>C. trigonus</i>	+		+						+			+	+		+	+	+	+				7
10	<i>Cucurbita maxima</i>	+					+			+	+		+	+		+	+	+	+				7
11	<i>C. pepo</i>	+					+			+	+		+	+	+	+	+	+	+				7
12	<i>C. moschata</i>	+	+							+	+			+	+	+	+	+	+				7
13	<i>Diplocyclos palmatus</i>	+								+	+			+	+	+	+	+	+				8
14	<i>Lagenaria vulgaris</i>	+								+	+			+	+	+	+	+	+				8
15	<i>Luffa acutangula</i>	+	+							+	+			+	+	+	+	+	+				7
16	<i>L. echinata</i>	+	+		+					+	+			+	+	+	+	+	+				7
17	<i>L. cylindrica</i>						+			+				+	+	+	+	+	+				7
18	<i>Melothria maderaspatana</i>	+	+	+						+	+			+	+	+	+	+	+				7
19	<i>Momordica charantia</i>	+	+								+			+	+	+	+	+	+				7
20	<i>M. dioica</i>	+	+	+									+	+	+	+	+	+	+				10
21	<i>M. balsamina</i>	+	+	+					+	+			+	+	+	+	+	+	+				9
22	<i>Trichosanthes dioica</i>	+	+		+		+			+	+		+	+	+	+	+	+	+				8
23	<i>T. anguina</i>	+	+	+					+	+	+		+	+	+	+	+	+	+				9
24	<i>T. cordata</i>	+		+					+	+			+	+	+	+	+	+	+				10
25	<i>T. cucumerina</i>	+			+					+	+		+	+	+	+	+	+	+				9
26	<i>T. bracteata</i>	+	+						+	+	+		+	+	+	+	+	+	+				8
27	<i>Benincasa hispida</i>	+								+	+		+	+	+	+	+	+	+				10
28	<i>Passiflora foetida</i>	+	+				+			+	+		+	+	+	+	+	+	+				9
29	<i>Begonia picta</i>				+		+			+	+		+	+	+	+	+	+	+				
	Total No. of Taxa-----	20	15	8	5	5	11	4	5	5	16	6	12	23	11	22	12	23	10	5	6	11	



TABLE -4B

## TAXAWISE DISTRIBUTION OF GLANDULAR TRICHOMES

OUT'S	NAME OF TAXA		TRICHOME TYPE											total types
			P	Q	R	S	T	U	V	W	X	Y		
1	Citrullus vulgaris		+				+			+	+		4	
2	C. fistulosus		+	+				+			+	+	5	
3	Coccinia cordifolia						+		+				2	
4	Ctenolepis garcinii				+		+			+			3	
5	Cucumis melo							+				+	2	
6	C. var. momordica				+	+			+				3	
7	C. var. utilissimus		+						+		+		3	
8	C. sativus							+		+	+		3	
9	C. trigonus			+		+						+	3	
10	Cucurbita maxima		+				+		+	+	+		5	
11	C. pepo				+		+		+		+	+	5	
12	C. moschata				+		+			+			3	
13	Diplocyclos palmatus				+					+			2	
14	Lagenaria vulgaris				+						+		2	
15	Luffa acutangula						+		+			+	3	
16	L. echinata		+								+	+	3	
17	L. cylindrica				+	+					+		3	
18	Melothria maderaspatana		+				+				+		3	
19	Momordica charantia								+		+	+	3	
20	M. dioica							+				+	2	
21	M. balsamina				+			+		+		+	4	
22	Trichosanthes dioica					+				+			2	
23	T. anguina		+				+				+		3	
24	T. cordata		+						+			+	3	
25	T. cucumerina		+				+					+	3	
26	T. bracteata		+				+					+	3	
27	Beninacasa hispida		+							+			2	
28	Passiflora foetida		+				+						2	
29	Begonia picta					+					+	+	3	
				12	2	8	5	12	5	8	9	13	13	

TABLE -5 DISTRIBUTION PATTERN OF TRICHOME TYPES ON DIFFERENT PLANT PARTS OF TAXA CONSIDERED  
IN PRESENT STUDY

PLANT PARTS		TRICHOME CODE																												TYPES No					
		A	I	AI	II	III	AV	AVI	AVII	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	31	
	STEM		+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	25
	TENDRIL	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	27
	PETIOLE	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+					+		+		+	+	+	22
	LEAVES UPPER SUR.	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	27
	LEAVES LOWER SUR.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	27
	LEAVES MARGIN		+	+	+	+					+	+	+	+		+	+	+	+	+	+	+	+	+				+	+		+			10	
	MALE FLS. PEDICEL		+	+	+	+		+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	21
	SEPAL		+	+	+	+	+	+		+	+	+			+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+		21	
	PETAL	+	+					+	+	+	+	+	+	+	+	+	+		+	+			+	+	+	+	+	+	+	+	+	+	+	22	
	STAMEN	+						+	+		+				+									+	+	+	+	+		+		+		11	
	FEMALE FLS. PEDICEL		+	+			+	+		+		+	+	+	+	+	+	+	+	+	+	+	+	+			+	+	+	+	+	+	+	24	
	SEPAL	+	+	+			+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	30
	PETAL	+	+				+	+	+	+	+	+	+	+	+	+		+	+	+				+	+	+	+	+	+	+	+	+	+	+	25
	OVARY	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	29
	STIGMA	+	+					+	+		+				+				+	+				+	+	+								10	
	No. OF ORGAN	11	14	11	9	9	11	8	12	8	13	7	11	14	9	12	12	11	14	9	6	8	13	9	11	11	11	10	10	11	13	11			

Glandular 4-celled Capitate (W) in 9 taxa ; Unicellular Glandular 4-celled Capitate (R) and Uniseriate Glandular 2-celled Capitate (V) in 7 taxa ; Bicellular Glandular 2-celled Capitate (S) and Bicellular Glandular M-celled (U) in 6 & 5 taxa respectively. Taxonomic evaluation of trichome type and their distribution become ease when they show very restricted occurrence to any taxa or any plant parts (Mishra 1984). Glandular 2-celled Capitate (Q) is observed in only 2 taxa viz. *Citrullus fistulosus* and *Cucumis trigonus*. Thus provide a distinct taxonomic significance.

The trichomic significance for taxonomic evaluation has been established by the contribution of many workers (Ramayya 1972; Sahu 1982, 1984;1985; Mishra 1984; Ahmad 1988; Panday 1989; Parihar 1998). It has also been found that trichomes play a significant role in taxonomic evaluation. Trichomes differ in their shape, size, cell structure and foot within genera . Further, when they are of characteristic form and distribution, they serve as a means of distinction among the species.

In present study they have also been found to play an important role in taxonomic delimitation of the taxa of Passiflorales occur in Central India. Total 29 species belonging to fourteen genera are considered in present study. Some genera are mono-specific ( e.g. *Coccinia*, *Ctenolepis*, *Diplocyclos*, *Lagenaria*, *Melothria*, *Benincasa*, *Passiflora* and *Begonia*) , other like *Citrullus* represent with 2 species; *Cucumis* with 5 species; *Cucubita*, *Luffa* and *Momordica* with 3 species each and *Trichosanthes* with 5 species respectively.

Among 29 taxa, two taxa viz. *Citrullus fistulosus* and *Momordica balsamina* possess maximum types of trichomes i.e. 14 types, followed by *Citrullus vulgaris*, *Ctenolepis garcinii* and *Trichosanthes*, *Cucumerina* have 13 types of Trichomes. Remaining taxa reveals 10-12 types of trichomes on different plant organs. *Begonia picta* of family Begoniaceae stand quite apart having minimum number of trichomes types (Table 4A & 4B).

Taxa of Cucurbitaceae are hairy and Trichomes have important tasks e.g. to protect leaves from insects, to insulate during cold weather, to protect from direct sunlight or to inhibit the growth of some fungi (Kolb & Muller 2004). In present study, all the considered taxa are, not only found hairy but all the plant organs (both vegetative and reproductive) also show occurrence of many types of trichome with various frequency. In this regard, out of 31 types of trichomes so observed in present study, 30 types recorded on Sepals; 29 types on Ovary; 27 types on Tendril; Leaves –upper and lower surface; 25 types on stem and Female fls. Petals; 24 types on Female fls. Pedicel; 22 types on Petiole and Male fls. Petals and 21 types on Male fls. Pedicel and Sepals. Leaves margin, Stigma and Stamen were the organs having lowest number of trichomes i.e. 10, 10 and 11 respectively.

Further, among Non-glandular trichome types Unicellular Conical (AII), Uniseriate Filiform (G) and Uniseriate Septate Flagellate (L) observed on 14 organs of the plant and stood highly frequent trichome of present study.

The presence of Capitate glandular trichomes is a characteristic feature of Cucurbitaceae. Capitate trichomes generally consist of rounded to pear – shaped heads of one, two, four or more cells supported by stalks of variable length . In present study total 10 types of glandular trichomes belonging to 3 categories were observed on vegetative and reproductive organs of considered taxa. Organographic distribution of these glandular trichomes along with complements of Non- glandular trichome provide an easy tool for taxonomic delimitation of taxa. These evidences are very much significant, not only at generic but at species level as well. (Table 3A & 3B)

Regarding the functional significance of Glandular trichomes , it has been suggested that their secretions may be involved in the chemical and mechanical defences against predators or may act as floral rewards to pollinators (Ascensae et. al 1999) . Similarly, significance of “neck-celled” glandular trichomes having



ability of cementing Arthropods to the leaf surface has already been reported in the taxa of Cucurbitaceae by Kolb & Muller (2004).

The perusal of table 5 reveals that among Glandular forms, Unicellular Glandular Capitate (P) and Uniseriate Glandular M-celled Capitate (x) trichome hold highest position of distribution, as they are recorded on 13 organs. It is also interesting to observe that leaves lower surface, male fls. Pedicel, female fls. Sepals, Petals and Ovary were the organs of one or the other taxa upon which all the Glandular types recorded.

In view of taxonomic evaluation of trichomes morphology and their distribution on different vegetative and reproductive parts of considered taxa, thorough observation of table 3,4 and 5 provide fruitful results.

Two species of genus *Citrullus* studied in present investigation. They are *C. vulgaris* (OTU -1) and *C. fistulosus* (OTU -2). These two taxa possess 13 & 14 types of trichomes respectively (Table 4A & 4B). They are found similar in having Unic. Conical (AII), Unis. Hooked (I), Unis. Curved (J), Unis. Conical (K), Unic. Gld. cap.(P) and Unis. Gld. M-celled cap. (X) type of trichomes. On the other hand, organs of OTU - 1 consist much more number of trichome types than OUT-2 (Table-3) and stand fairly distinct in having Unic. Pap. (AI) on Petals, stamens and stigma Bic. Conical (D) on Leaves margin; Bic. Gld. 2-celled Cap. (T) on Stem & Leaves upper surface and Unis. Gld. 4-celled cap. (W) on Stem, Petiole and Pedicels of male and female flowers. The presence of Unic. Gld. 2-celled cap. (Q) at Leaves margin and on Stigma of OTU -2 is quite identical for taxonomic delimitations.

*Coccinia cordifolia* (OTU -3) is a monospecific taxa in present study. Trichome complex observed on different organ is A IV, AVI, AVII, B E F I K & O among Non-gld. and T,V among Gld. trichomes. Taxonomic evaluation of this taxa is done on the bases of organographic distribution. Presence of 6 non-gld. types and two gld. types on Stem is quite identical. More over, frequent

occurrence of Bic. Gld. 4-celled cap. (I) & Unis. Gld. 2-celled cap. (V) on Stem, Tendril, Leaves, Pedicel, Sepals & Petals and presence of Unicellular curved (AIV) on almost all the organs provide an additional support for identification.

OTU -4 is *Tenolepis garcinii*. It exhibit 9 Non-gld. and 3 Gld. type of trichome. They are AI, AII D, G, H, I, J, K, L and R, T, W. In this taxa, almost all the organs show Glandular type trichomes. Among these, Unic. Gld. cap. (R) observed on Leaves, Leaves margin, Sepals, Petals, Stamens and Stigma; where as Bic. Gld. 4-celled cap. (T) on Tendril, Sepals & Petals; Unis. Gld. 4-celled cap. (W) on Stem, Leaves, Pedicel and Ovary. Thus, with the occurrence of Bic. Conical, Unis. Curved, Unis. Conical, Unis. Septate flagellate, Unic. Gld. 4-celled cap, Bic. Gld. 4-celled cap. and Unis. Gld. 4-celled cap. on floral organs provide taxonomic significance.

The study of Chopra & Seth (1977) regarding relationship of haustorial length with seed size in 14 species of cucurbitaceae, reveals different degree of association. Accordingly OTU -4 stand at equal distance to *Citrulus* and *Momordica*. Results of present study also agree with this findings e.g. OTU -4 and OTU -1 posses 9 types of common trichomes, where as OTU -4 and OTU -21 share 8 types as common ones.

All the five species of *Cucumis* i.e. OTU -5, 6,7,8, & 9 are related in having Unicellular papillose and unis. Gld. cap. Type of trichomes. Other trichome complements specially glandular ones provide significant taxonomic delimitations among these five OTU's. *Cucumis melo* possessing maximum number of trichome types stand quite distinct with Unis. Neck-celled gld. cap. Trichome (Y) (Table 4B). Though, this (Y) type also recorded from OTU -7 but both differ quitly in organographic distribution. (Table 3). Taxonomic identity further enhance by Bic. Gld. M-celled cap. (U) present on Tendril, Leaves, Sepal, Petals and Ovary along with Y in OTU -5. Though OTU -6 and OTU -7 differ

quite in their morphology, habit and fruit shape and size, but in taxonomic literature, OTU -6 and OTU -7 are recorded as variety of OTU -5.

These are *C. melo*.var. *momordica* (OTU - 6)& *C. melo* var *utilissimus*(OTU - 7). They show only 40% of resemblance in their trichome complex where as OTU -7 proved much nearer to OTU -5 having 60% of common trichomes . Seven types of non-gld. (AI , AII, D E G I & M) and 3 types of gld. types recorded in OTU - 6. Among these, presence of Uniseriate Belemnoid (M) on Stem, Tendril, Petiole, Pedicel and Bic. Gld. 4-celled cap. (R) on Tendril, Sepals, Petals, Ovary , Stigma & Stamen provide distinct position among all the 5 taxa . *Cucumis melo* var. *utilissimus* in addition to sharing A1, G , I and V as common types with OTU -6 stand separated by the presence of F H J K P and X types (Table 4A 4B). On the other hand OTU -8 and OTU -9 are identical in having common four types of non-glandular trichomes, but quite differ in glandular trichome types and their distribution . *Cucumis salivus* (OTU - 8) show one type of Bic. Gld. i.e. Bic. Gld. M-celled (U) and two types of unis. Gld. i.e. Uniseriate Glandular 4-celled Capitulate (W) & Uniseriate Glandular M-celled Capitulate (X) on different parts. Distribution of these glandular types particularly on Sepals, Petals and stamens along with unicellular types provide trichomic identification. *Cucumis trigonus*. (OTU -9) with 10 types exhibit all the categories of trichomes. Among non-glandular, Bic. Cylindrical (C) is the type which recorded only in this species of *Cucumis* . More over, its presence on ovary becomes taxonomic marker to this taxa . Besides trichome C, Unic. Arrect (AIII) is another trichome type present on Petiole, Leaves and Sepals of OTU -9 except OTU -5 , where it is widely distributed on Stem, Tendril, Petiole, Leaves, Pedicel and Sepals. Further it is very interesting to note that both OTU -5 and OTU -9 exhibit Y type of trichome, but they absolutely differ in their capitulate heads. In OTU - 5, head is found multicellular, inflated and infolded round body where as it is absolutely 2-celled , cells long and clavate. Thus, besides other

trichome complements, Y is itself quite significant for taxonomic evaluation among these two taxa .

Three species of *Cucurbita* i.e. *C. maxima* (OTU -10), *C. pepo* (OTU -11) and *C. moschata* (OTU -12) were collected and considered for trichome study . All the three taxa found similar in having Uniseriate Hooked (I) and Bic. Gld. 4-celled cap. (T) trichomes. Though, all the three taxa are hispidly hairy but they quite differ in their trichome complexes and their organographic distribution. Total 7 types of non-glandular trichomes recorded from each taxa but about glandular types, OTU -12 provide three types where as maximum 5 types among all considered taxa are recorded from OTU -10 and OTU -11 (Table 4B) . In view of percent similarity about trichome structures, OTU -10 stand quite close to OTU -11 and OTU -12 revealing 60% similarity from both the taxa. On the other hand, OTU-11 and OTU-12 are very poor in their association. Perusal of common trichome types shows only 25% similarity in between these two taxa. Organographic distribution of trichomes in these three OTU's reveals that *C. maxima* is the taxa which possesses a typical complex of 4 non-gld. trichome types. They are Unis. Hooked (I) , Unis. Curved (J), Unis. Conical (K) and Unis. Sept. Flag. (L). This combination is not observed in any other taxa other than *Ctenolepis garcinii*. Among glandular , 5 types i.e. Unic. Gld. Cap. (P), Bic. Gld. 4-celled cap (T), Unis. Gld. 2-celled cap. (V), Unis. 4-celled cap. (W) and Unis. M-celled cap. (X) are observed from different vegetative and floral parts (Table 4-B). Similar to non-glandular complex , V,W & X complex of glandular trichome is not observed in any other taxa of Passiflorales. Thus these two complexes are quite identical for *C. maxima* only. *C. Pepo* (OTU-11) also studied earlier by Kolb and Muller, 2004. They reported four type of glandular trichomes on both the surface of leaves. Present study also reveals similar results.

Moreover, these types not only recorded from leaves but also frequently recorded from stem (TVY types) tendril (T) , Petiole (X), Leaves (T & Y),



Pedicel (Y), Sepals (T & Y), Petals (X & Y) Ovary (P & V ) and Stigma (P). Thus, presence of these glandular types on reproductive organs and Uniseriate Belemnoid (M) on Stem, Leaves, Pedicel and Sepals provide trichomic identification to this taxa. It is observed that *C. moschata* (OTU -12) closely related to OTU -10 than OTU -11 in trichome complexes. OTU -12 has distribution of seven non-glandular and 3 glandular type of trichomes only . But presence of Unicellular conical (AII) and Uniseriate Cylindrical (H) trichome exhibit its separate position among othertaxa of *Cucurbita* . moreover, distribution of Unic. Gld. cap . (R) on stamen and unic. Conical (AII) Unis. Flag. (L) and Unic. Gld. cap (R) on stigma further support its trichomic identification.

*Diplocyclos palmatus* (OTU -13) and *Lagenaria vulgaris* (OTU - 14) are the taxa which can be singled out by their specific trichome distribution. Total 10 types were recorded in OTU -13 , in which two are glandular types (R & W). Unis. Gld. 4-celled cap. (W) has restricted distribution being present only in 9 taxa and OTU 13 is one of them. Moreover, its presence on leaves margin put this taxa away from OTU -14. *Lagenaria vulgaris* (OTU -14) reveals similar pattern of trichome but presence of Unic. Gld. 4-celled cap. (R) trichome on Leaves, Petals, Ovary and Stigma is quite distinctive. Further, OTU -13 differ from OTU -14 in having Unic. Arrect (AII), Unic. Flagellate (AVI), Unis. Cylindrical (H), Unis. Conical (K), Peltate (O) and Unis. Gld. 4-celled cap. (W) types of trichome.

Although , OTU 15, 16 & 17 of genus *Luffa* have been found similar in one or the other trichomes , yet they show marked differences in the distribution of similar and dissimilar form of hairs. *Luffa acutangula* (OTU -15) and *L. echinata* (OTU -16) observed similar in AII, G, K,O and Y types and OTU -15 & *L. cylindrica* (OTU -17) only in G & K types. Where as OTU -16 & OTU - 17 show AV, G, I,K and X type of trichomes as common ones. Thus, OTU - 16 observed close to OTU -15 on one hand and to OTU -17 on other hand. But rest

of the trichome with their distinctive organographic distribution make them quite distinct from each other thus Unic. Conical (AII) Unic. Curved (AIV), Bic. Belemnoid (F), Bic. Gld. 4-celled cap. (T) and Unis. Gld. 2-celled cap. (V) on *L. acutangula*; Bic. Conical (D) and Unic. Gld.cap. (P) on the Stem, Tendril, Leaves, Petals, Stamen one or the other way of *L. echinatus* and presence of Unic. Flagellate (AVi), Unis. Cylindrical (H), Unis. Sept. flagellate (L) and Unic. Gld. 4-celled cap. (R) and Bic. Gld.2-celled cap. (S) on different vegetative and reproductive organs of *L. cylindrica* put them quite identical (Table 4A &4B).

*Melothria maderaspatana* (OTU -18) appeared quite identical to all the considered taxa in present investigation. Trichome complex of 10 types is recorded from this taxa (viz. AII,AIII,AVI, D,I,K,M,P,T & X). Unis. Belemnoid (M) is one of the restricted type. It is abundantly present on Stem and Pedicel. Similarly, occurrence of two types of Unic. Conical hairs (AII) and Unis. Hooked (I) combination on Leaves surface and margin appeared as taxonomic marker for OTU -18 .

Analysis of trichomes complements among considered three species of *Momordica* reveal that all the three taxa are similar in having Unic. Papillose (AI), Unis. Filiform (G) , Unis. Cylindrical (H) Unis. Hooked (I) and unis. Neck-celled gld. cap. (Y) trichomes. But other forms put them quite distinct as *M. charantia* (OTU -19) possese AII, L,M,V and X types where as *M. diocica* (OTU-20) shows AIII,F,K and U types. Third taxa of this genus i.e. *M. balsamenia* (OTU -21) observed at quite distance from rest two having maximum types of trichome i.e. 14. It reveals 10 types of non-glandular and four types of glandular trichomes on their vegetative and repraductive organs (Table. 4A, 4B,, 5A, & 5B). Among these fourteen types AI, AIV, F,G,H,I,U & V are observed common in between this and OTU -20 . Where as Bicellular Cylindrical (C), Unis. Curved (J) Unic. Gld. 4-celled cap. (R) and Unis. Gld. 4-celled Cap. (W) trichome being

present on OTU 21, side by side distribution of AI, AII, C, L & R types on stigma stand it quite distinct among all the taxa considered in present study.

Five species of *Trichosanthes* have been investigated presently. These are *T. dioica*, *T. anguina*, *T. cordata*, *T. cucumerina* and *T. bracteata* i.e. from OTU- 22 to OTU -26 . Perusal of table 4A & 4B reveal that all the five species have reticulate association regarding trichome affinity viz. *T. dioica* (OTU -22) & *T. anguina* OTU -23 have four types , OTU -22 & *T. cordata* (OTU -24) and OTU -22 & *T. cucumerina* (OTU -25) have five types and OTU -22 & *T. bracteata* (OTU -26) have four types as common trichome. Similarly, OTU -23 to OTU- 24, OTU -25 and OTU -26 is observed having five – five types of common trichomes separately. Maximum percent affinity is observed inbetween OTU -24 & 25, OTU 24 & 26 and OTU -25 & 26 having eight types of trichome as common one . However, detailed organographic distribution of common types and restricted occurrence of remaining particular types, significantly help in delimitation of taxa. For example , *T. bracteata* stand quite separate from rest four species (i.e OTU -22,23,24,25) for not having peltate (O) trichomes. But it observed significant with the presence of Uniseriate Septate Flagellate hair (L) not only on Stem, Tendril, Pedicel, Sepals, Petals but also on Ovary along with other trichome types (Table 3A & 3B). *T. dioica* and *T. anguina* exhibit quite similarity bearing Unic. Conical, uniseriate filiform, Unis. Curved and Peltate hairs. However, presence of Unic. Curved (AIV) on Petiole, Leaves & Ovary; Unis. Gld. 4-celled cap. (W) on Stem, Petiole; Leaves, Pedicel of only *T. dioica* and Bic . Conical (D) , Stellate (N) type on Petiole, Stem, Pedicel of *T. anguina* play an important role in taxonomic delimitation of these two taxa . Further, *T. cordata* & *T. cucumerina* also exhibit their piculear trichome complexes and organographic distribution. *T. cordata* reveals frequent occurrence of Unic. Arrect (AIII), Bicellular filiform (B) Bic. Cylindrical (C) on Tendril, Leaves, Petal and Unis. Gld. 2-celled cap. (V) on Petiole, Leaves upper surface, Pedicel,

Sepals, Petals and Ovary while *T. cucumerina* appeared quite identical showing Unic. Falcate (AI), Unic. Cylindrical (AVIII) and all the three types of glandular hairs on different parts of vegetative and reproductive organs. It is interesting to note that Chopra & Seth (1977) reported quite taxonomic distance in between *T. cucumerina* and *T. anguina* regarding the haustorial length and seed size. In present study, similar observation occurred regarding trichome types, their groups and distribution (Table 3A & 3B). *Beniscasa hispida* (OTU -27), the last taxa of Cucurbitaceae considered presently, also appeared quite identical in comparison of other taxa. Though, only eight types of non-glandular and two types of glandular trichome could be recorded from this plant, but abundant presence of each of the types on almost all the organs of plant is a very interesting feature. In this regard, the study of Khan et. al (2000) on Benincasa's four genotypes prove that trichome density has a significant negative influence on the number of aphids. Trichomes in this taxa play a major role by providing a first line defence in reducing aphid infestation, with a subsequent beneficial effect of reducing the incidence of virus. The perusal of table 3A & 3B regarding the various trichome complexes present on different parts provide an identical taxonomic tool for plant identification (viz. Presence of Unicellular Flagellate, Unis. Filiform, Unis. Hooked, Unis. Conical, Stellate on Leaves-surface; Unis. Hooked, Unis. Gld. 4-celled cap. on Leaves margin; Unic. Papillose on Stamen and Unic. Flag., Unis. Fili., Unis. Cylind., Unis. Hooked, Unis. Conical, Stellate, Unic. Gld. Cap and Unis. Gld. 4-celled cap. on Ovary. This observation is quite fruitful, not only for taxonomic evaluation of trichome morphology and distribution, but also in studying plant defence mechanism in different plant groups at generic or family level.

Only single species of *Passiflora* i.e. *P. foetida* (OTU -28) of Passifloraceae and single species of *Begonia* i.e. *Begonia picta* of Begoniaceae is collected from Central India. These two taxa are ornamental and scarce in



distribution. These two exhibit twelve types of trichome during present investigation (Table 4A & 4B). Previously, Garcia, et. Al (2000) studied four species of *Passiflora* to investigate the possible existence of trichome types of diagnostic value to identify them, but not in India.

In present investigation, four types of unicellular forms (AI, AII, AV, AVI), two types of Bicellular form (D & E) and 4 four types of unis. Forms (G, K, L & O) of non-glandular types and Unic. Gld. cap. (P) with Bic. Gld. 4-celled cap. (T) were recorded from *P. foetida*. Though maximum type of non-glandular trichome observed in this taxa, but none of them showed abundant frequency. Moreover, with the presence of maximum type of unicellular hairs (AI, AII, AIII) along with Bic. Asept. Flagellate, unis. Sept. flag. And unic. Gld. cap. on ovary place this taxa at quite distance from taxa of Cucurbitaceae on one hand and *Begonia picta* on other hand. It is also interesting to observe that *P. foetida* is the only taxa in present investigation in which Unic. Pappilose, Bic. Asept. Flag. and Unic. Gld. cap. trichome were recorded from stamens.

*Begonia picta* (OTU-29) the only species of Begoniaceae come out as unique and identical for trichome complexes. Stem, Petiole, Leaves –upper & lower surface, Pedicel and Sepals are observed densely covered by maximum types of trichomes. Out of total 12 types recorded from this taxa, nine types viz. Unic. Curved, Bic. Conical, Unis. Filiform, Unis. Curved, Unis. Conical, Unis. Belemnoid, Stellate Unis. Gld. 2-celled cap and Unis. Neck-celled Gld. Cap were present on Stem only. Similarly, only leaves showed eleven types of trichome i.e. AiV, Avi, D, E, G, J,K,M,N,S & Y. Moreover, presence of Unic. Flagellate, Bic. Conical, Bic. Asept. Flag, Unis. Curved and Unis. Neck-celled gld. cap trichome complex on ovary put it to quite distance from taxa of Cucurbitaceae.

Further, it has already been established that trichome often play very significant role in taxonomic considerations. Moreover, when they are of characteristic form and restricted to a species, they can serve as a means of

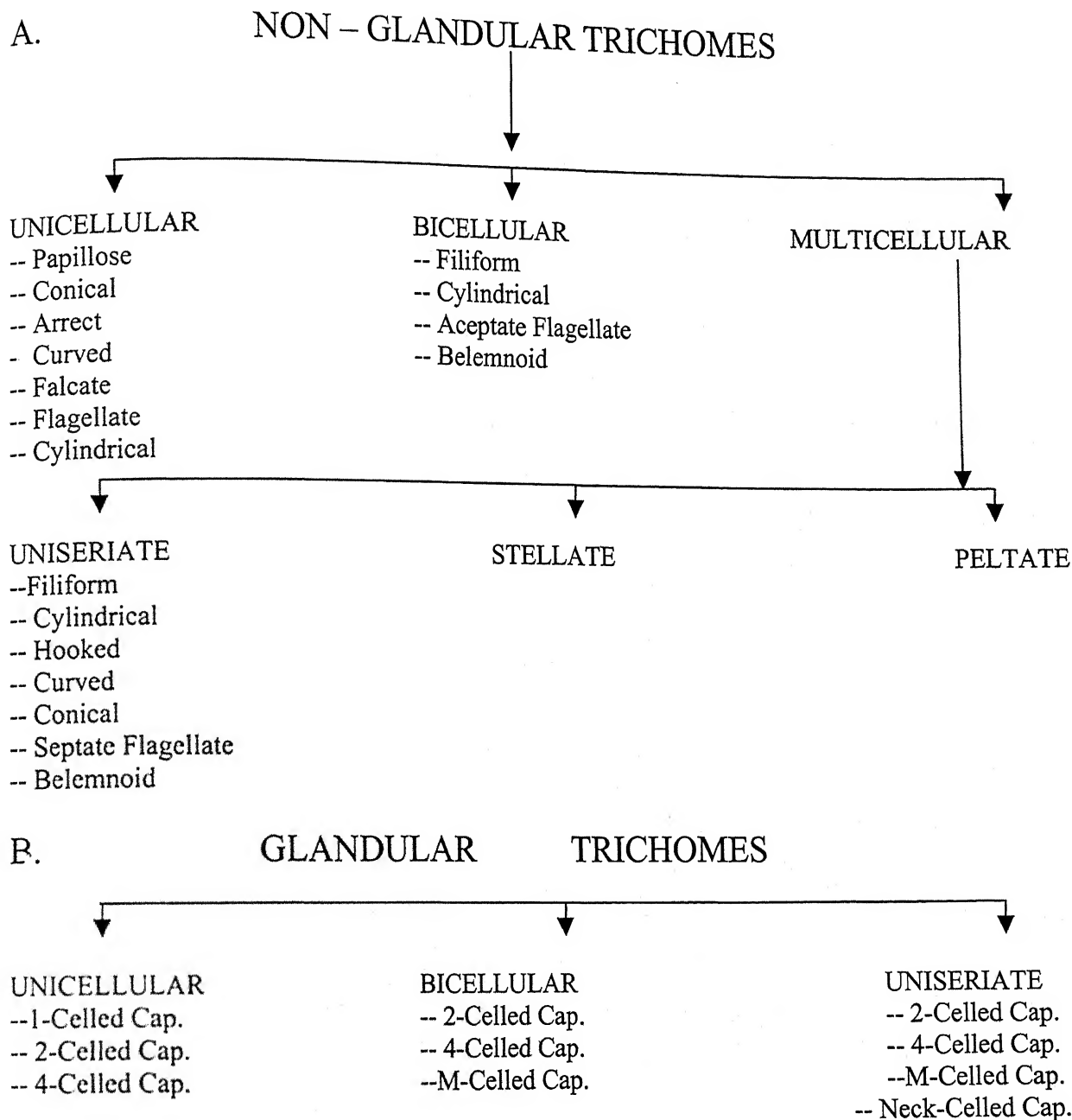
distinction among the species. During present investigation not only unicellular forms (AIV, AV & AVII) but 3 Bicellular types (B,C & E), 2 Uniseriate types (M & N), as well as among glandular forms (Q, S , U,) have also been observed as taxonomic markers (Table 3A,3B, 4A & 4B). For example Unicellular cylindrical is recorded only from four taxa viz. *Coccinia cordifolia*, *Cucumis sativus*, *Trichosanthes cucumerina* and *T. bracteata*.

Similarly, Unicellular Curved, Unicellular Falcate, Bic. Filiform, Bic. Cylindrical and Unis. Belemnoid are the Trichome types which are recorded only from Five taxa (Table 4A & 4B). This restricted occurrence as well as present on specific organ of a taxa provides a means of identification as well as taxonomic distances among species of a genus.

Besides above restricted forms, other forms which attested their systematic importance in present study are: Bic Cylindrical on Stigma of *M. balsamina*; Unis. Sept. Flagellate on Stigma of *Cucurbita moschata* and *M. balsamina*; Unic. Gld. Cap. On the Stigma of *Cucumis melo* var. *utilissimus*, *Cucurbita maxima*, *Trichosanthes anguina* and *T. cucumerina*; Unic. Gld. 2-celled Cap. On the Stigma of *Citrullus fistulosus* only and Bic. Gld. 2-celled Cap. On Stigma of *Begonia picta* only.

Thus , owing to various trichome complexes, not only in different taxa, but also on a particular organ of plant body, it is evident that trichomes structure, association and distribution can be utilised for taxonomic delimitations, not only at generic level but also at inter specific level, successfully. Moreover, they may be of much interest to Pharmacognosists, Archeobotanists, Paleobotanists and Agronomists.

TABLE -6 CLASSIFICATION OF TRICHOMES OBSERVED IN PRESENT STUDY



## CHAPTER-V.

SUMMARY

AND

CONCLUSION

## CHAPTER V SUMMARY & CONCLUSION

Order Passiflorales is a large group of tropical and sub-tropical families which show tremendous diversity in their taxa. In Central India, 22 species belonging to 11 genera of Cucurbitaceae only recorded by Maheshwari (1963). Where as, in the floristic composition of Bhopal region 1 genus & 1 species of Passifloraceae, 10 genus & 17 species of Cucurbitaceae and 1 genus & 1 species of Begoniaceae is reported by Oommachan (1977).

Earlier, Misra (1982) made an exhaustive floristic survey of Central India. He could collect 32 taxa belonging to 17 genera of 3 families i.e. Cucurbitaceae (28 taxa) Passifloraceae (3 taxa) and Begoniaceae (1 taxa).

In present study, total 29 taxa belonging to three families of Passiflorales are taken into consideration (Table-1). Trichome morphology, types and organographic distribution of each type is observed thoroughly for taxonomic evaluation of this discipline.

The number of excellent studies have attested the taxonomic importance of trichome structure at group, generic and specific level. Hence, in present study, taxa belonging to 3 families (viz. Cucurbitaceae, Passifloraceae & Begoniaceae) of order Passiflorales occurring in Central India were taken into consideration.

In present investigation, total 31 forms of trichome are recorded. Among these, 21 were of non-glandular and 10 of glandular types. Non- glandular trichomes, further categorised into Unicellular , Bicellular , Uniseriate, Stellate and Peltate . Glandular are grouped into Unicellular, bicellular and uniseriate stalked structure . These further categorised into 1-celled , 2-celled, 4-celled , M-celled capitate head. Neck- celled structure is unique and considered as separate type (Table-6)

An occurrence of total trichome types in considered group is given below:

Trichome group	Cucurbitaceae	Passifloraceae	Begoniaceae
Non-Gld.	21	10	09
Gld.	10	02	03

In view of taxonomic evaluation, detailed analyses of trichomes types and their organographic distribution in the studied taxa also attested that trichomes can be used as taxonomic marker. The following observations and conclusions reveal taxonomic significance of trichomes:

1. Some new trichome forms are recorded in present investigation whereas other affirms the earlier record.
2. In present investigations total 31 types (21 non-glandular & 10 glandular) trihomies are recorded.
3. Type of trichomes complexes and their specific distribution on various plant organs proved taxonomic significance in delimiting the taxa at inter-specific level during present study.
4. Similar significance of trichome complex has also been established at generic and group level.
5. Restricted occurrence of some particular trichomes types to certain taxa is also observed. This specific appearance further help in delimiting one species from other. For example, Unicellular Cylindrical is recorded only from four taxa of present investigation. Similarly, Unicellular Curved (AIV), Unicellular Falcate (AV), Bicellular Filiform (B), Bicellular Cylindrical (C) and Uniseriate Belemnoid (M) are the trichome types restricted to 5 taxa each among all the 29 taxa. Moreover, occurrence of these types on specific organ of plants further help in assessing taxonomic significance and distances.
6. *Coccinia cordifolia*, *Luffa acutangula*, *Trichosanthes dioica* of Cucurbitaceae and *Passiflora foetida* and *Begonia picta* of family Passifloraceae & Begoniaceae respectively possess Unicellular Curved type trichome.



7. Unicellular Falcate (AV) is recorded from *Cucumis sativus*, *Lagenaria vulgaris*, *Luffa echinata*, *Luffa cylindrica* and *Trichosanthes cucumerina* only.
8. Bicellular cylindrical (C) is observed on *Cucumis trigonus*, *Momordica balsamina*, *Trichosanthes dioica*, *T. cordata* and *T. bracteata* only.
9. A typical trichome having conical head i.e. Uniseriate Belemnoid (M) is the trichome which is reported as an important tool of plant defence for larvae and insects, also recorded with restricted occurrence. It is abundantly observed on *Cucumis melo* var. *momordica*, *Cucurbita pepo*, *Melothria maderaspatana*, *Momordica charantia* of Cucurbitaceae and *Begonia picta* of Begoniaceae.
10. Though, Cucurbitaceae is known for their hairy taxa, but stellate types are recorded only from six taxa viz. *Citrullus fistulosus*, *Cucumis melo*, *C. sativus*, *Trichosanthes anguina*, *Benincasa hispida* and *Begonia picta*.
11. Bicellular aseptate flagellate (E) is another typical trichome type having 1-celled erect base and 1-celled, very long, whiplash distal part. This is also observed as restricted type and useful in delimitation of certain taxa. Taxa are *Coccinia cordifolia*, *Cucumis melo* var. *momordica*, *Trichosanthes dioica*, *T. cucumerina*, *Passiflora foetida* and *Begonia picta*.
12. Glandular trichomes are known to play a role in the secretion of compounds to protect organs against Predators or to attract Pollinators when present on Ovary and Stigma. In present study, total Ten types of glandular trichomes are recorded. Among these, some are found very restricted in distribution. They are unicellular gld. 2-celled capitate, Bicellular Gld. 2-celled Capitate and Bicellular Gld. M-celled Capitate.
13. Unicellular Gld. 2-celled Cap. (Q) trichome is recorded from *Citrullus fistulosus*, particularly on Stigma and Sepals & Petals of *Cucumis trigonus*.



Thus, distinctive distribution of this type provides trichomic identification to OTU-2 and OTU-9.

14. Bicellular Gld. 2-celled cap. (S) reveals presence on *Cucumis melo* var. *momordica*, *Cucumis trigonus*, *Luffa cylindrica*, *Trichosanthes dioica* and *Begonia picta*.
15. Similarly, Bicellular gld. M-celled capitate (U) is recorded from *Citrullus fistulosus*, *Cucumis melo*, *C. sativus*, *Momordica dioica* and *M. balsamina*.
16. Though, uniseriate Neck- celled Gld. capitate (Y) is recorded from 13 taxa , but freequent structural difference in head provides trichomic taxonomic evaluation for delimitation of species at generic leval. For example, *Citrullus fistulosus* stand quite distinct having Y type with head of 4-columnar cells in palisade type of arrangement.
17. Among 5 species of *Cucumis*, OTU – 5 possess Y type with multicellular , globose head where as OTU –9 is quite distinct from rest four in having head of 2-celled, lanceolate, oblong structure.
18. Among 3 species of *Cucurbita*, OTU –11 i.e. *Cucurbita pepo* is the only taxa from which Unis. Neck-celled Gld. trichome of multicellular head, could observed.
19. All the 3 species of *Luffa* are observed quite identical in their trichome complexes . Besides other non-gld. and Glandular types , *Luffa acutangula* (OTU -15) possess Unis. short – necked Gld. trichome of multi-cellular globose head, where as neck is very long and bi-conave in *L. echinata* (OTU - 16). Third one i.e. *L. cylindrica* does not possess Y type, but proved quite identical having abundant occurrence of Bic. Gld. 2-celled cap trichome.
20. In present investigation, Y type has over come as most significant trichome, viz. All the three species of *Momordica* appeared quite distinct about number of cells in the head of Unis. Gld. Neck-celled trichome. It is observed 2-celled

in *Momordica charantia*, 4-celled in *M. dioica* and multicelled in *M. balsamina*.

21. Similarly, out of five species of genus *Trichosanthes*, long necked, multicellular head is recorded in OTU -24 & OTU -26, where as 4-celled in OTU -25 only . OTU -24 & OTU 26 further stand quite distinct in absence or presence of Bic . Gld. 4-celled cap trichome respectively.
22. *Begonia picta* of Begoniaceae is appeared close to some taxa of Cucurbitaceae in having Y type of trichome, in comparison of Passifloraceae . Further , this taxa stand at quite distance from others, revealing Bic. Gld. cap. , Unic. Curved, Bic. Asept. Flagellate. Unis. Belemnoid and Stellate types (AIV, E, M & N) of trichomes of restricted occurrence.
23. *Passiflora foetida* of Passifloraceae is also appeared as piculear taxa revealing maximum type of unicellular types of trichome along with Unic. Gld. cap. and Bic. Gld. 4-celled cap. on reproductive parts.
24. It is also interesting to note that some of taxa proved quite identical regarding the occurrence of certain type of trichomes on Stamens and Stigma, besides the unicellular ones. These are *Citrullus fistulosus* (Unicellular Gld. 2-celled Capitate), *Ctenolepis garcinii* (Unicellular Gld. 4-celled Capitate), *Cucumis melo var. momordica* (Unicellular Gld. 4-celled Capitate), *Cucumis melo var. utilissimus* (Unic. Gld. Capitate), *Cucurbita maxima* (Uniseriate sept. flag. On Stamen and Unic. Gld. Cap. on Stamen & Stigma), *C. pepo* (Unic. Gld. 4-celled Cap. on Stigma), *C. moschata* (Unic. Gld. 4-celled Cap. on Stamens and Unis. Sept . Flag. & Unic. Gld. 4-celled Cap . on Stigma), *Lagenaria vulgaris* (Unic. Gld. 4-celled Cap. on Stigma), *Luffa echinata* (Unis. Filiform on Stamen & Stigma, Unic. Gld. Cap. on Stamens), *Momordica balsamina* (Bic. Cylindrical & Unic . Gld. 4-celled Cap. on Stamen & Stigma, and Unis. Sept. Flag. on Stigma), *Trichosanthes anguina* (Unic. Gld. Cap. & Unis.. Gld. multicelled Cap. on Stamen and only Unic. Gld. Cap. on Stigma), *T. cordata*

(Bic. Cylindrial and Unic. Gld. Cap. on Stamen only), *T. cucumerina* (Unic. Gld. Cap. on Stamen & Stigma), *T. bracteata*, *Benincasa hispida* and *Passiflora foetida* (Unic. Gld. Cap. on Stamen only) and *Begonia picta* (Bic.Gld.2-celled Cap. on Stigma only).

25. During present investigation not only Unicellular forms (AIV, AV & AVII) but three Bicellular types (B, C & E ), two uniseriate types (M & N) as well as among glandular forms (Q, S & U ) have also been observed as taxonomic markers.
26. Thus, in view of occurrence of trichome types and their specific organographic distribution , it is proved that this discipline of epidermal structure is a successful tool and can also be used as taxonomic marker in delimitation of taxa at generic and inter- specific level.
27. The present study reveals that the taxonomic value of trichome structures and distribution are of special relevance in the taxa of considered three families of order Passiflorales.

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